

NOTICE

VAXstation I Installation

Hardware installation of a VAXstation I purchased from DIGITAL is provided by trained service personnel at no additional cost. To schedule your VAXstation I installation, contact your local DIGITAL Field Service branch office.

Field Service installs hardware, verifies correct functioning of hardware using system diagnostics, and demonstrates ability to run MicroVMS.

After the hardware installation process, you may install the complete software product and optional layered products. If you do not wish to install your own software, a Software Installation Service is available. The back of this page describes services available from DIGITAL.

VAXstation I Installation Services Available from DIGITAL

DIGITAL SOFTWARE SUPPORT SERVICE

- On-site Assistance for Update Installation and Critical Situations
- Telephone Support
- Software Information Network
- Newsletters
- All Media and Documentation Updates
- Software Problem Reporting Mechanism

BASIC SOFTWARE SUPPORT SERVICE

- Same as SOFTWARE SUPPORT SERVICE, excluding On-site Assistance for Update Installation and Critical Situations.

SELF-MAINTENANCE SOFTWARE SERVICE

- Media and Documentation Updates
- Newsletters
- Software Problem Reporting Mechanism

ADDITIONAL SOFTWARE SERVICES

- Software Consulting Services
- Special multiple SOFTWARE SERVICE agreements

BASIC HARDWARE SERVICE

- On-call remedial maintenance from 8:00 am to 5:00 pm
- No charge for material and labor for coverage window
- Preventive maintenance
- No charge ECOs (Engineering Change Orders)

ADDITIONAL HARDWARE SERVICES

- On-call remedial maintenance (up to 24 hrs/day, 7 days/wk)
- Committed response time (4 hrs or less up to 100 miles)
- Continuous remedial service until system is operational
- Preventive maintenance outside of normal work hours
- Self-maintenance service
- Carry-in service for remedial maintenance
- DECMAILER mail-in service for remedial maintenance

For additional information about these services, call your local DIGITAL service office or call 1-800-DEC-8000 (USA only).

This manual describes the VAXstation I components, installation, operation, and troubleshooting procedures.

VAXstation I Owner's Manual

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Preface

Read this manual before your VAXstation I is installed. You will need to refer to this manual as you install and begin to use your computer. If you experience system problems, you can also refer to this manual to isolate the error before seeking other help. If you then require further assistance, please call 1-800-DEC-8000 (USA only) and a DIGITAL representative will help you.

WHAT THE VAXSTATION IS

The VAXstation I is a single user, stand-alone, 32-bit microcomputer workstation with a 19-inch (diagonal), black-and-white display monitor, a mouse, a keyboard, and a 31M-byte fixed disk drive. Hardware options include printers, tilt-swivel assembly for the monitor, rack-mount, a memory module, a 31M-byte free-standing disk drive, communications link to DECnet Ethernet networks, and a DZV11 4-channel asynchronous serial-line multiplexer. Software options include FORTRAN, C, and other MicroVMS applications.

The entire VAXstation I fits on and under a desk.

The VAXstation I expands the utility and convenience of the MicroVMS operating system by providing the user with as many terminals (simulated on the VAXstation screen) as needed. Each simulated terminal can run processes independently of the others, and each terminal permits the VAXstation keyboard to be associated with it at any time.

You can create, move, and discard simulated terminals and other menus and processes in *windows* on the screen by moving a pointer, using the mouse. The result allows you to view or manage a variety of activities in parallel rather than in serial. For example, you can:

- Examine a compilation listing while editing the source file
- Read notices without exiting from other programs
- Start one task and follow its progress while interacting with another
- Send mail without exiting an editing session
- Print a list of files on your own printer while creating other files (requires the printer option)

Once a simulated terminal has been created on the VAXstation, the terminal can be used as if it were a real terminal. The operating system is neither

changed nor simplified by the VAXstation — but the system may be made significantly more convenient.

The VAXstation monitor and graphics module allow medium-resolution bit-map graphics applications.

Using the standard Graphics Kernel System (GKS), a programmer can create applications that produce 2-dimensional pictures.

MANUAL CONVENTIONS

Throughout the manual, user input and some user actions have been highlighted in red, for example, the main point of an installation instruction or the suggested response to a prompt for a command:

```
>>> B DUA1
```

Uppercase letters in examples indicate that you should type exactly what is written. Lowercase letters indicate a variable: you type the specific instance of the variable you need.

The **Return** key is not shown in all command examples. Assume that you must press **Return** after typing a command unless told otherwise.

MANUAL ORGANIZATION

The manual is divided into the following parts:

- Base System Installation
- Operation
- Option Installation
- Troubleshooting

Base System Installation

This part describes how to unpack, install, and test the system. You must read the following information before installing the system:

- **Chapter 1** describes preinstallation procedures, including checking the shipment and ensuring adequate site preparation.
- **Chapter 2** describes how to set up the system unit, monitor, keyboard, and mouse and how to connect and test the system.
- **Chapter 3** describes how to install the MicroVMS Base System and Workstation Software.

Operation

This part describes the operation of the VAXstation I:

- **Chapter 4** describes the system controls and indicators.
- **Chapter 5** explains how to create windows for processes, move windows, connect the keyboard to a process, use VT100 and Tektronix 4014 emulation, and, set and change terminal, keyboard and other characteristics, and print with a printer connected to the system unit console port.

Option Installation

This part describes how to install the hardware options for the VAXstation I.

- **Chapter 6** explains how to set up hardware options for the VAXstation I. These include the LA50 and LA100 printers, rack-mount, tilt-swivel base, MSV11-Q memory module, RD52-D free-standing disk, DEQNA Ethernet controller, and the DZV11 interface module.

Troubleshooting

This part describes the procedures to isolate a problem and decide what to do next. The following information is provided:

- **Chapter 7** outlines some basic trouble-shooting procedures, illustrates the parts inside the system unit and summarizes the diagnostics and the troubleshooting flow.
- **Chapter 8** describes how to use the diagnostics for the VAXstation I.

Appendix A describes the console interface, including the console commands, messages, and halt codes.

Appendix B describes Tektronix 4010/4014 terminal emulation in more detail than Chapter 5.

RELATED DOCUMENTS

- *VAXstation I Software Release Notes* (Order No. AV-DY64A-TE) contains last-minute information about the Workstation Software.
- *VAXstation I Video Device Driver Manual* (Order No. AA-DY65A-TE) contains information about the VCB01 device driver for programmers.
- *MicroVMS V4.0 Release Notes* (Order No. AV-CJ72B-TE) contains last-minute information about MicroVMS.
- *MicroVMS User's Manual* (Order No. AA-Z209B-TE) describes the operation of the MicroVMS operating system.

- *MicroVMS User's Primer* (Order No. AA-Z210B-TE) introduces the MicroVMS operating system.
- *MicroVMS User's Pocket Reference* (Order No. AA-Z211B-TE) summarizes the DIGITAL Command Language (DCL), EDT editor, DIGITAL Standard Runoff (DSR), and MAIL commands.
- *VAX GKS/0b Software Reference Guide* contains information about GKS.
- *VAX GKS/0b Installation Guide* describes the installation of GKS.
- *VAXstation I System Pocket Service Guide* (Order No. EK-VS200-PS) contains information about troubleshooting the VAXstation I hardware.
- *VAXstation I Technical Reference Manual* (Order No. EK-VS200-TM-001) is for users who want to know more about the VAXstation hardware, in particular the VCB01 module.
- *MicroVAX I CPU Technical Description* (Order No. EK-KD32A-TD) is for users who want details about the internal operation of the MicroVAX I CPU.

1

Preparing for Installation



A typical VAXstation I
installation

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CHECK YOUR SHIPMENT

Check your shipment against the packing list on the outside of one of your boxes. Your basic shipment consists of two cartons:

1. **The VAXstation I system unit carton**, with unpacking instructions on the outside, which contains:
 - Media and documentation box, containing:
 - VAXstation I Owner's Manual*
 - Three diskettes for testing and troubleshooting

- Accessories box, containing:

Installation and testing accessories, including a screw driver, a loop connector, labels, two blank diskettes, feet for the table-top unit, and a grant card (for use by your support personnel)

- System unit power cord
- BC18T—10 video cable
- VS20C—F VAXstation I system unit prepackaged with its floor stand

2. **The VAXstation I consolidation carton** contains:

- VR100 graphics monitor
- Extension cord
- Monitor power cord
- Fuse for 220 volt operation, taped to the bottom of the monitor
- LK201 keyboard with its cable for connecting the keyboard to the video cable
- VS10X mouse and cable connecting to the system unit
- Software media and documentation, if ordered

If you ordered media and documentation, you will also receive a **software kit box**, which contains:

- Either the MicroVMS extended base kit contained in the VAXstation I kit (QQX01—H3) or the MicroVMS full kit contained in the VAXstation I kit (QQX02—H3)

The extended base kit contains:

RX50 diskettes for stand-alone backup, the Base System, and other MicroVMS optional software

MicroVMS User's Manual

MicroVMS User's Primer

MicroVMS User's Pocket Reference

MicroVMS Release Notes

The full kit contains QXX01-H3 plus:

MicroVMS FORTRAN Programmer's Manual

MicroVMS FORTRAN Programmer's Primer

Programming Support Manual

Programming Support Pocket Reference

Additional RX50 diskettes containing program development tools

- The MicroVMS Workstation Software package, containing:

RX50 diskettes containing the MicroVMS Workstation Software

VAXstation I Software Release Notes

VAXstation I Video Device Driver Manual

- The Graphics Kernel (GKS) software package, containing:

RX50 diskettes containing the GKS software

VAX GKS/0b Software Reference Guide

VAX GKS/0b Software Installation Guide

You should also check for any other optional items that you may have ordered, such as additional software or a printer.

If your shipment appears damaged or if any item is missing, inform the delivery agent and contact your sales representative or the store where you purchased your system.

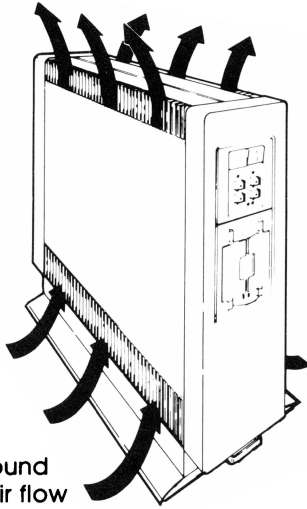
SITE PREPARATION REVIEW

Before installing your system, review the following site preparation requirements. You must provide:

- Adequate space for the system unit and peripherals
- Electrical power
- Suitable operating environment

Space Planning

Allow sufficient space around the system unit and monitor to access the units and to enable the proper circulation of air through the units.



Allow space around
system unit for air flow
and servicing

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The System Unit

The floor-standing system unit fits under a standard 30-inch (76.2 cm) desk or table. With the floorstand, its dimensions are 48.3 x 13.3 x 63.5 cm. The unit can be converted to a table-top version by removing the pedestal and fitting rubber feet (see Chapter 2).

The unit should be placed where the user can change diskettes easily. The power and system interconnecting cables should be run in areas where no one will trip over them. Do not place heavy objects on the cables. Avoid straining the cables or bending them sharply.

The ac power source should be adequate to supply the original system and allow for system expansion. The ac power requirements of the system unit are 345 watts, 120 volts, 60 cycles. The heat dissipation is 1092 BTU/k.

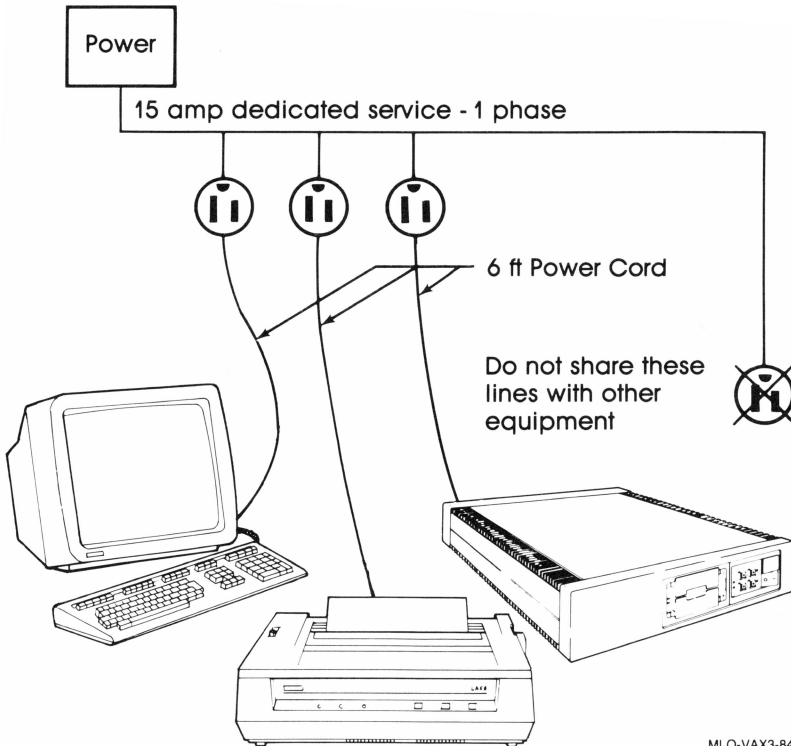
The Monitor

Position the monitor for ease of use. The power source should be adequate to supply the original system and allow for system expansion. A 15-ampere branch circuit from the power distribution panel is recommended for each system. This circuit must meet all national and local standards, provide a good system ground, be stable, and free from electrical noise.

NOTE

Do not connect other equipment, such as air conditioners, office copiers, or coffee pots, on the same circuit as that of the system unit or that of the monitor.

If power disturbances cannot be prevented, you may need more power conditioning equipment.

**ENVIRONMENT****Temperature and Humidity**

The VAXstation I's location should have an environmental control system to maintain the recommended range of temperature and humidity at all times. This system should filter dust and other contaminants from the air and should provide for an even distribution of air to prevent hot spots. The VAXstation I should not be located near heaters or in direct sunlight.

The recommended temperature range is 59 to 90 F and 15 to 32 C (operating). The recommended humidity range is 20 to 80% (operating).

NOTE

Your service contract may require specific limits for temperature and humidity. Those limits will override those listed.

Static Electricity

Static electricity may cause a system to fail, data to be lost, and other problems. The most common source of static electricity is the movement of people in contact with carpets and clothing. Low humidity results in the greatest buildup of static electricity. The following suggestions will help reduce static buildup:

- Maintain greater than 40% relative humidity.
- Try to locate the system away from busy areas.
- If a carpet is already fitted at the selected location, place antistatic pads under the system.

Dust

Dust particles can clog air passages inside the equipment, thus reducing the cooling airflow and diskette life, especially if the particles are abrasive. Cleaning the system area regularly helps reduce those effects.

Supplies Storage

Supplies, such as diskettes, must be stored at the same temperature and humidity levels as the system.

2

Setting up the Hardware

This chapter describes how to assemble, connect, and test the VAXstation I.

NOTE

Your service representative will perform the initial installation of the VAXstation I hardware.

THE SYSTEM UNIT

Make sure your system unit is located in accordance with the site preparation suggestions in Chapter 1. You can use the system unit in its floor stand or convert it to the optional rack-mount or table-top version.

If you have ordered the optional rack-mount kit, go to Chapter 6 and follow the installation instructions provided there.

If you are not converting the floor-standing version, go to the **INSTALLING THE MONITOR AND THE KEYBOARD** section in this chapter.

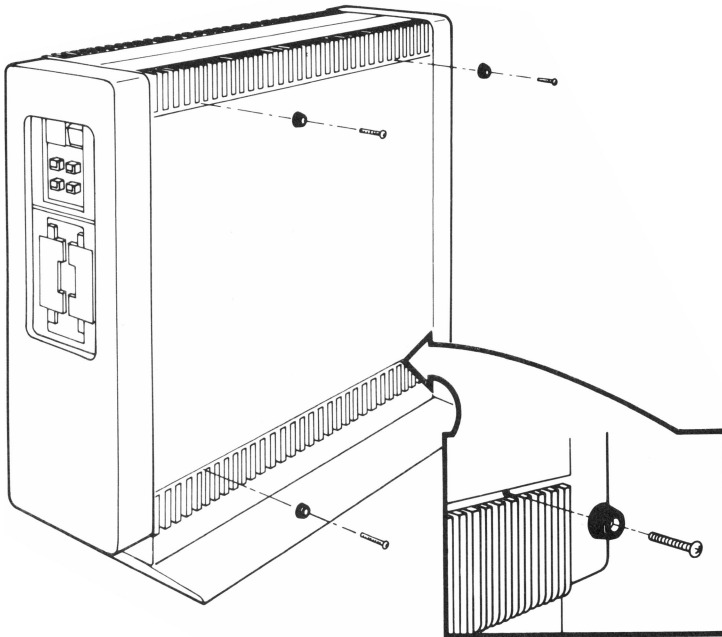
Optional Table-Top Conversion

To perform the table-top conversion, follow these instructions:

CAUTION

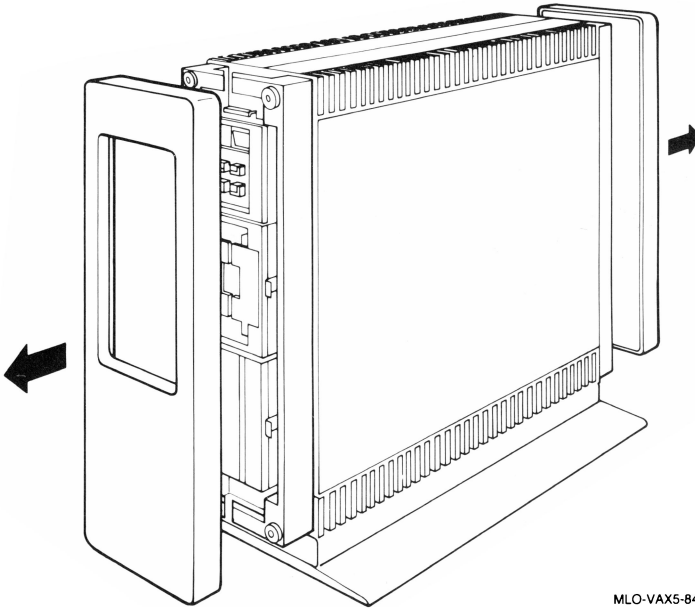
You need two people to carry out these procedures. The system unit weighs 22.68 kg.

1. Locate and screw the four rubber feet into the side of the system unit as shown. The rubber feet, screws, and screwdriver are part of the installation accessories package that you removed when you opened the system unit carton.



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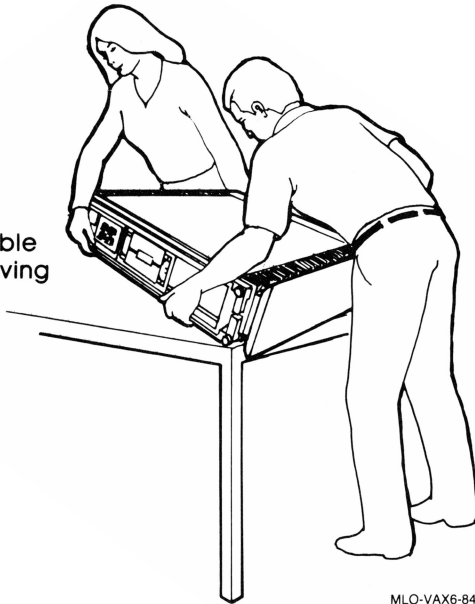
2. Remove the rear and front covers by carefully pulling them by the top and bottom edges. To facilitate removal, disengage the top edge first.



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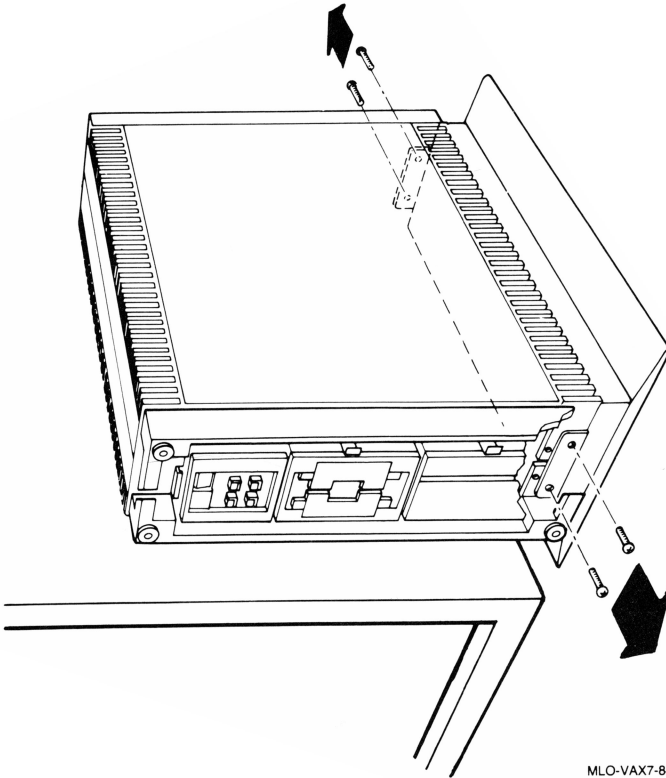
3. Place the system unit on a table or desk with the floor mount pedestal hanging off the edge.

Use handles / cable guides when moving system unit



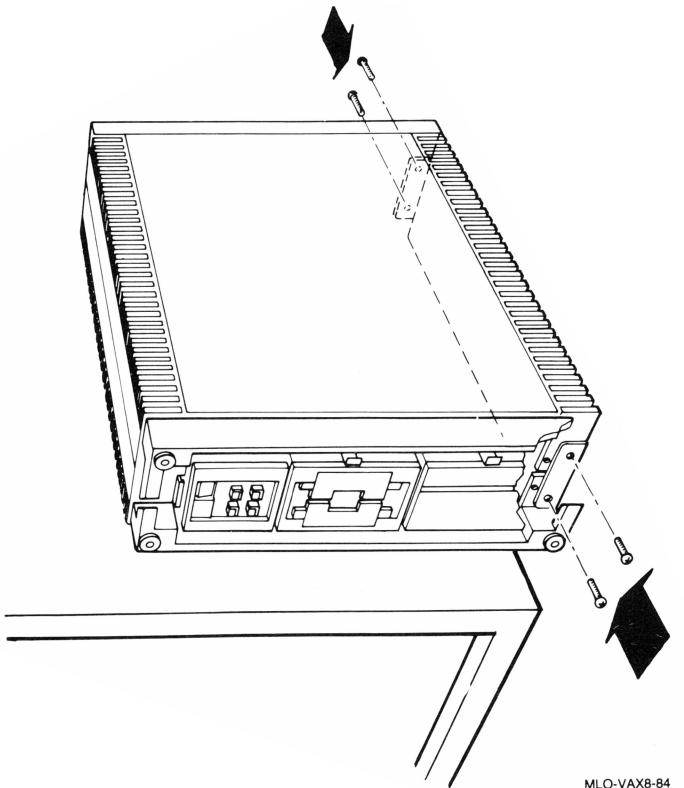
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4. Use the screwdriver to remove the inner set of front and rear screws that hold the unit to the pedestal.



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5. Replace the two front and two rear screws into the covers without the pedestal.



INSTALLING THE MONITOR AND THE KEYBOARD

This section explains how to set up the VR100 monitor and the LK201 keyboard.

CAUTION

Do not plug in the monitor power cord until directed. Do not switch on the monitor power until directed.

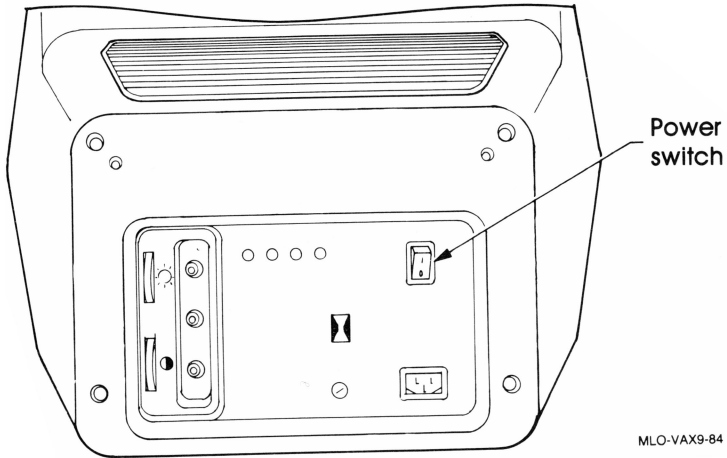
WARNING

You will need two people to carry out these procedures. The monitor weighs 44.1 lb (20 kg).

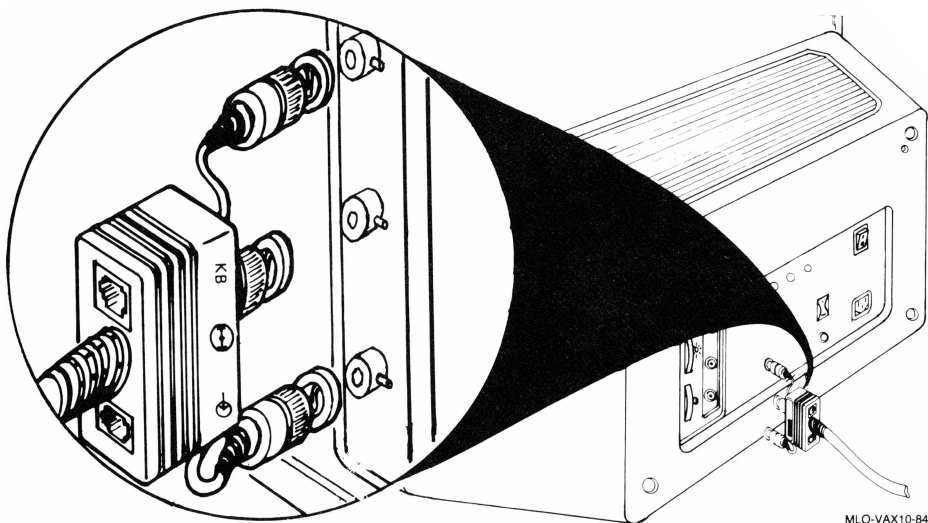
1. Move the cartons containing the monitor and the keyboard close to their final location.

Open the cartons and remove the monitor, the keyboard, the power cord, and the extension cord.

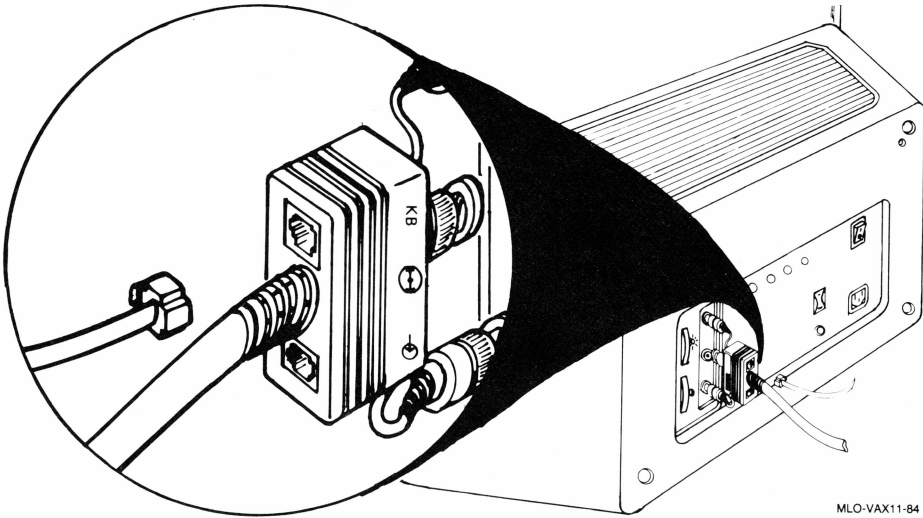
2. Make sure the monitor power switch is set to 0 (off).



3. Place the monitor on a desk or table and connect the BC18T-10 (or BCC03-06) video cable from the system unit carton to the monitor by inserting the BNC jacks as pictured below. Follow the corresponding icon moldings on the video cable and the monitor to put the jacks in the correct color connector. Turn the connector clockwise about half a turn.



4. Insert the legend strip into the slot at the top of the keyboard. Connect the keyboard to the video cable.



MLO-VAX11-B4

THE MOUSE

To set up the mouse, remove it from its carton and place it near the keyboard and close enough to the system unit so that the mouse cord can reach the system unit. Instructions on how to attach the mouse appear in the next section.

CONNECTING THE MONITOR, MOUSE, AND SYSTEM UNIT

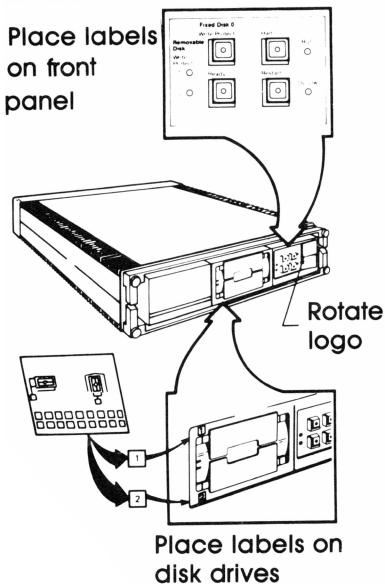
This section covers the final steps in connecting your VAXstation I. If you have purchased options for your VAXstation I, you should first read Part III, Option Installation.

1. Locate the labels sheet in the installation accessories package.

On the table-top version, label the disk drives and the front control panel. Rotate the logo.

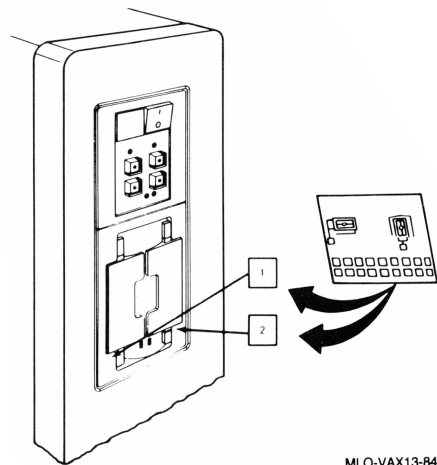
If you have a floor-standing system unit, only the disk drives need to be labeled.

Table Top Version



MLO-VAX12-84

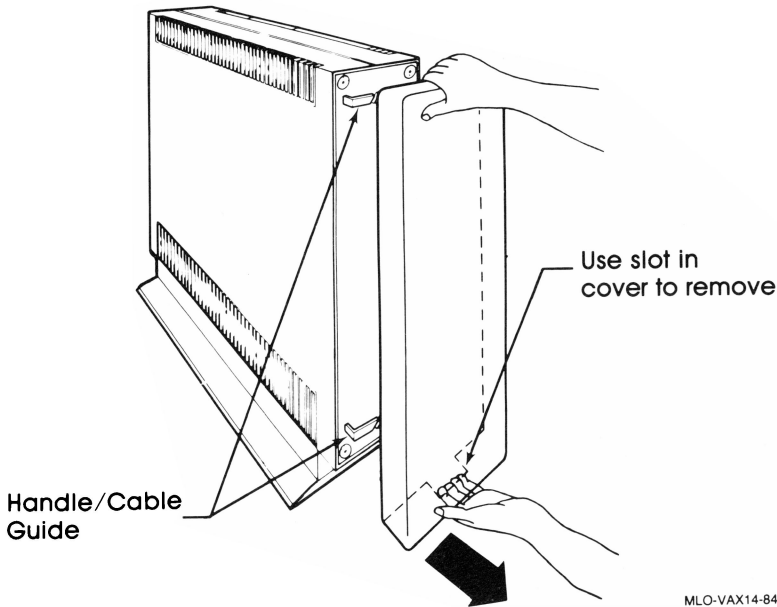
Floor Standing System



MLO-VAX13-84

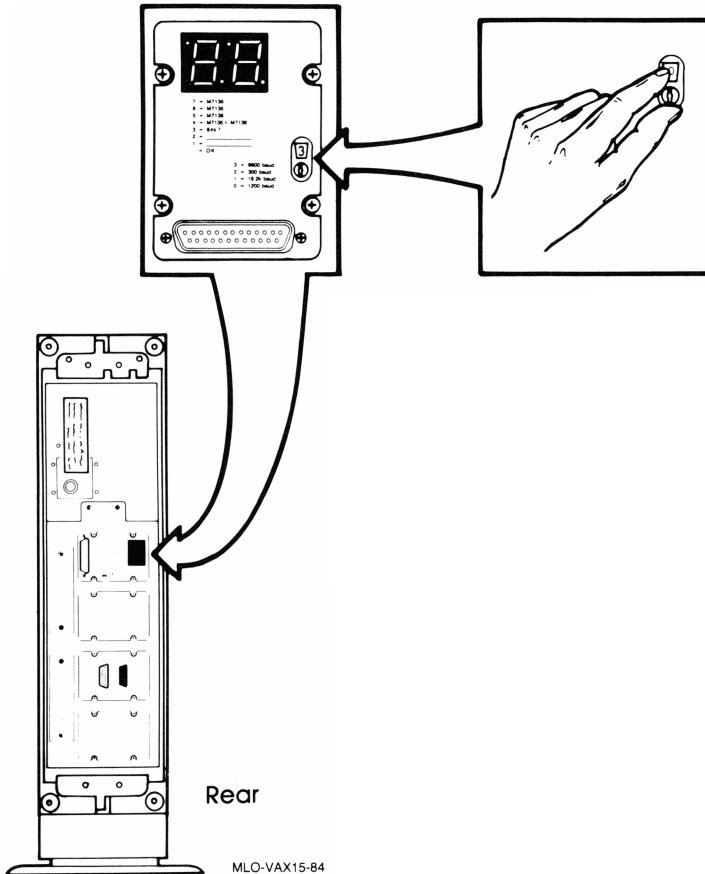
2. Remove the rear cover of the system unit by carefully pulling it off. To facilitate removal, disengage the top edge first. You will have already removed the cover if you performed the table-top conversion.

The handles/cable guides will be exposed. These guides are to be used as handles to move the system unit around and as guides for the cables.

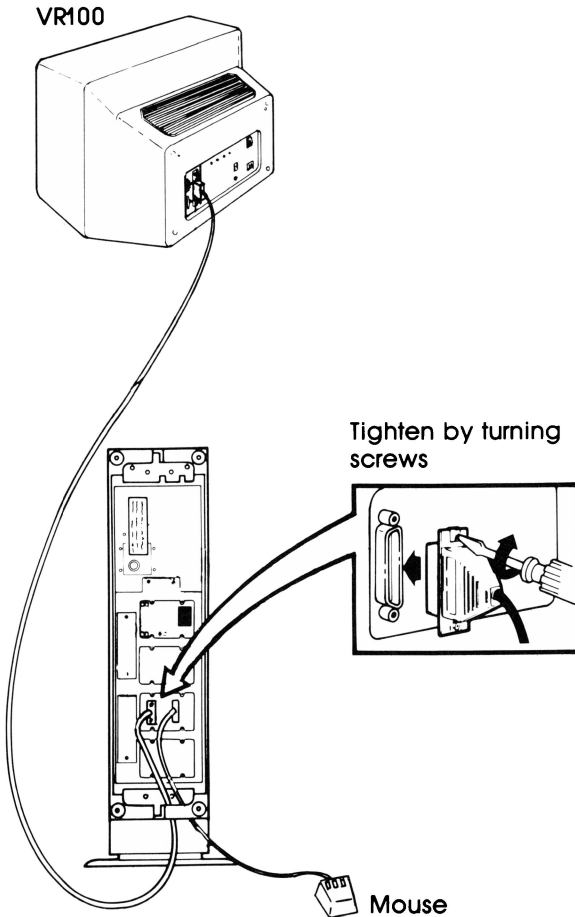


MLO-VAX14-84

3. Ensure the system unit baud rate is set at 9600 baud. The adjustment control knob on the CPU patch panel, as illustrated below, should be set to 3, which is equivalent to 9600 baud.



4. Connect the video cable to the larger of the two connectors on the panel (pictured below) on the rear of the system unit. Route the cable through the cable guide located at the base of the floor-standing unit or the far left of the table-top one. Tighten the screws on the connector.
5. Attach the mouse cable next to the video cable connector to the connector on the system unit. Tighten the screws.



6. Check the monitor voltage switch setting. The voltage is set to 115 volts in the factory for units that are shipped to the United States. If you have to change the setting to 230 volts, slide the switch over as shown.

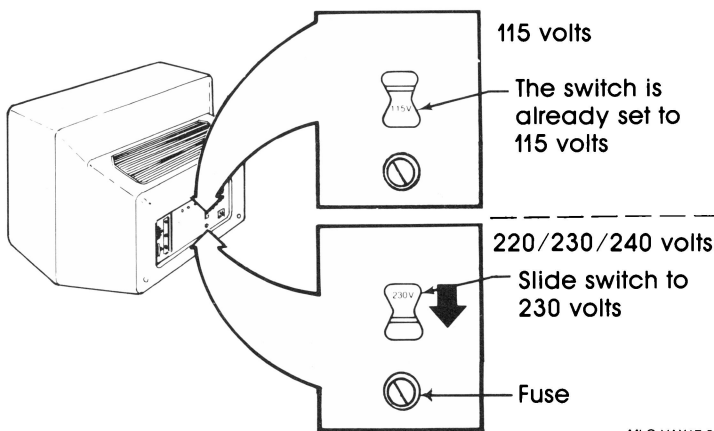
CAUTION

An incorrect voltage setting will damage your equipment.

NOTE

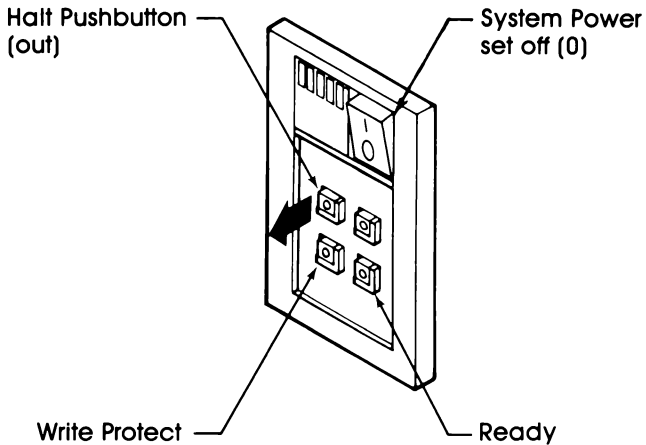
230 volts is common in European and other countries.

7. If you need to change the fuse to 230 volts, use the screwdriver to remove the fuse in the monitor and replace it with the fuse in the plastic bag taped to the bottom of the monitor.



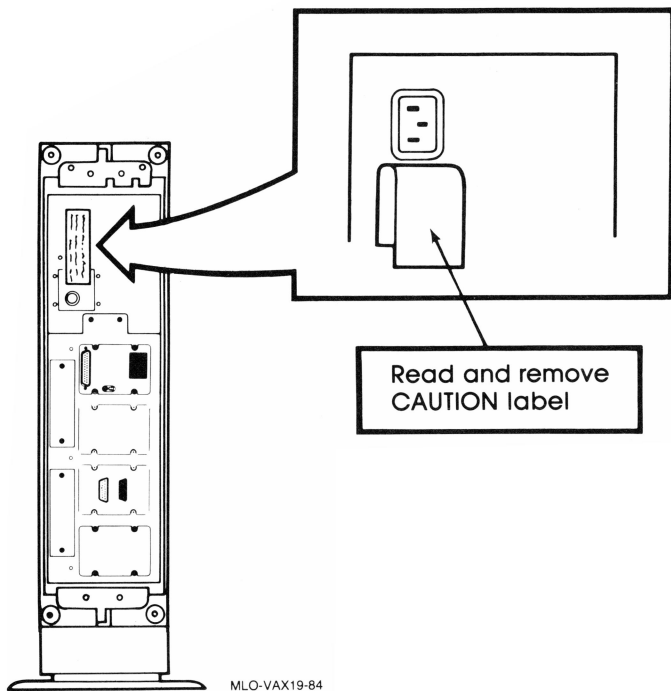
MLO-VAX17-84

8. Before you proceed with connecting the VAXstation I, make sure that the monitor power switch is set to 0 (off), all the pushbuttons on the front control panel are "out," and the power switch on the front control panel is set to 0 (off).

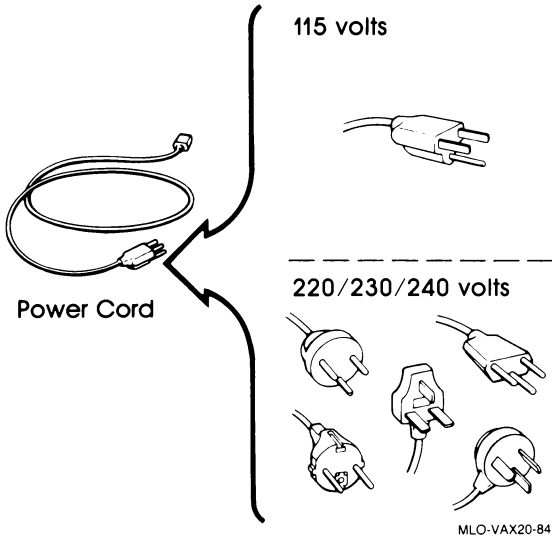


MLO-VAX18-84

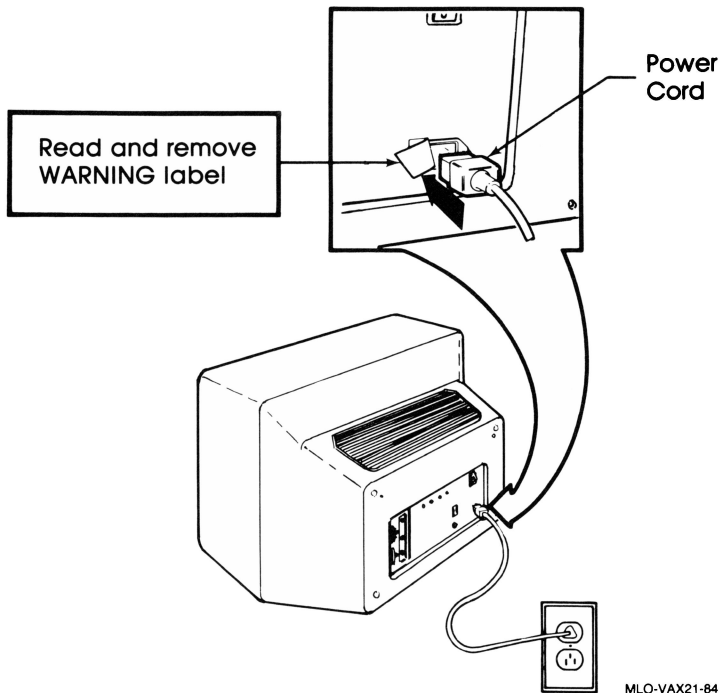
9. Read and remove the **CAUTION** label covering the power connector and voltage switch on the rear of the system unit.



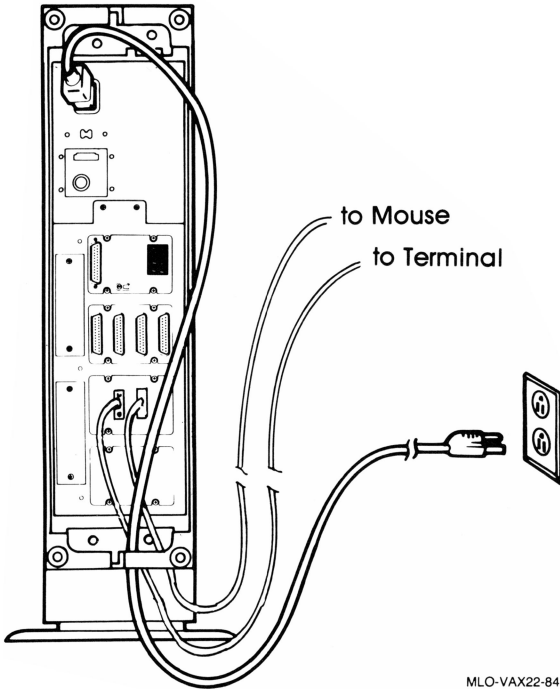
10. Identify the monitor and system unit black power cords. Ensure the plug is the type required for your wall receptacle.



11. Connect the monitor power cord to the monitor and to an outlet.

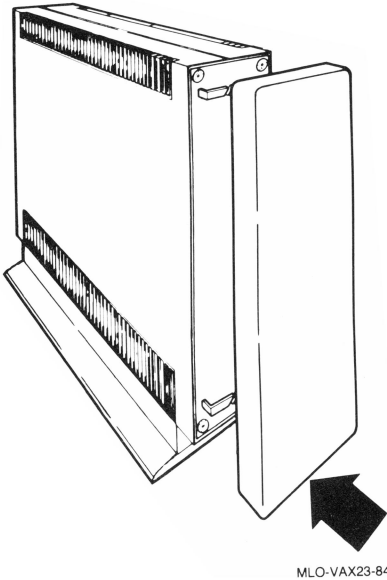


12. Connect the system unit power cord by plugging one end firmly into the system unit power connector. Route the cable through the cable guide and insert the 3-prong plug into the wall receptacle.



MLO-VAX22-84

13. Snap the rear cover into place. Your VAXstation I is connected and ready for testing. Before turning on the power, carry out the testing procedure described in the next section.



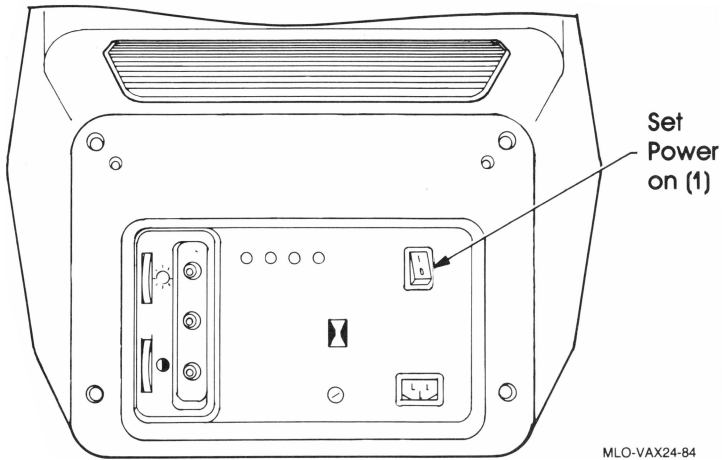
MLO-VAX23-84

TESTING THE VAXSTATION I

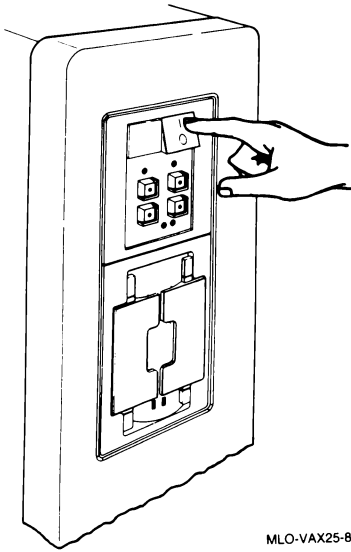
The first time you power up your system, follow the steps in this section.

1. Power up the monitor by setting the power switch to 1.

After about one minute, the screen should lighten. If no lightening occurs, adjust the contrast and brightness dials on the back of the monitor until the screen is lit.



2. Turn on the power to the system unit by pushing the front control panel system power switch to the 1 position.



The screen will illuminate and the **MICROVERIFY STARTED** message will appear on the monitor screen.

MICROVERIFY STARTED

MICROVERIFY PASSED

> > >

MLO-VAX26-84

Microverify is a diagnostic program that checks out the basic parts of your system.

3. Wait about 5 seconds for the "MICROVERIFY PASSED" message to appear. That message informs you that Microverify has finished without detecting any errors. If you see any of the following messages, just continue with the testing procedure:

```
00000000 03
ATTEMPTING RESTART

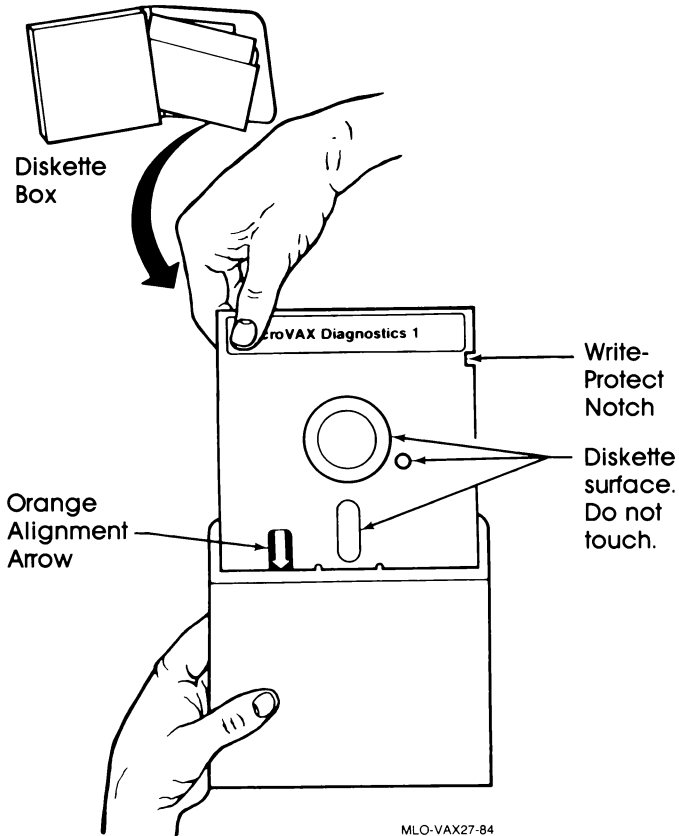
RESTART FAILED
ATTEMPTING BOOTSTRAP

%BOOT-F-ERROR, None of the bootable devices contain
a program image.
000008BB02
```

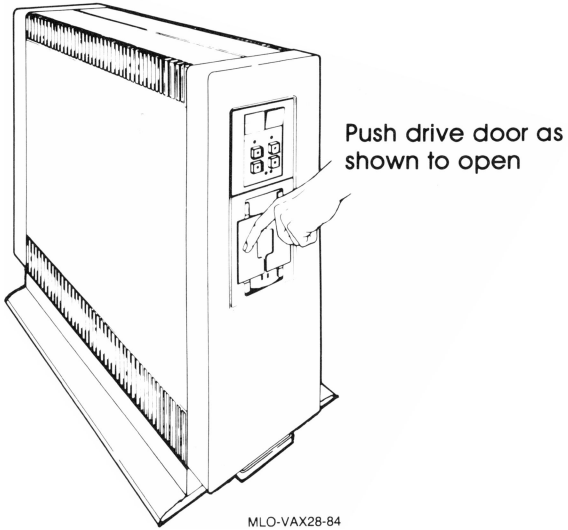
However, if you see any other message or no messages at all, see Part IV, Troubleshooting.

4. If the "MICROVERIFY PASSED" message appeared, you are ready to run the second diagnostic program, Macroverify. Macroverify checks that the rest of your system is working properly. Before running Macroverify, make sure that all devices connected to the system unit are turned on.

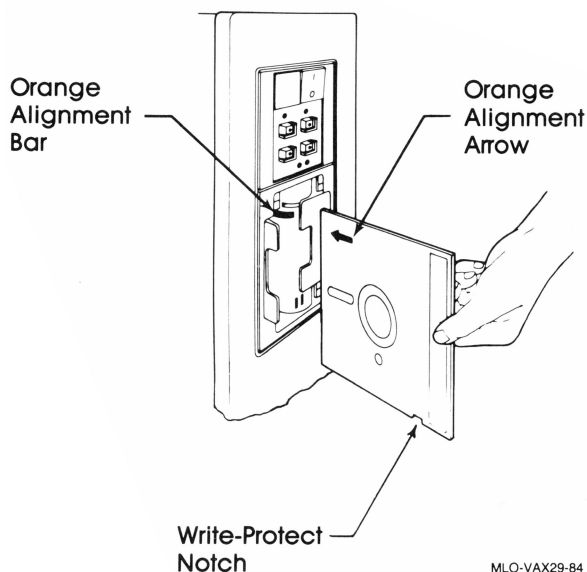
5. Locate a blank diskette and the diagnostic diskette labeled "DIAGNOSTICS 1" in the accessories kit that came in the system unit carton.



6. Open the door of diskette drive 1 by pressing the upper half of the top drive door (table-top versions) or the left half of the left drive door (floor-standing versions).

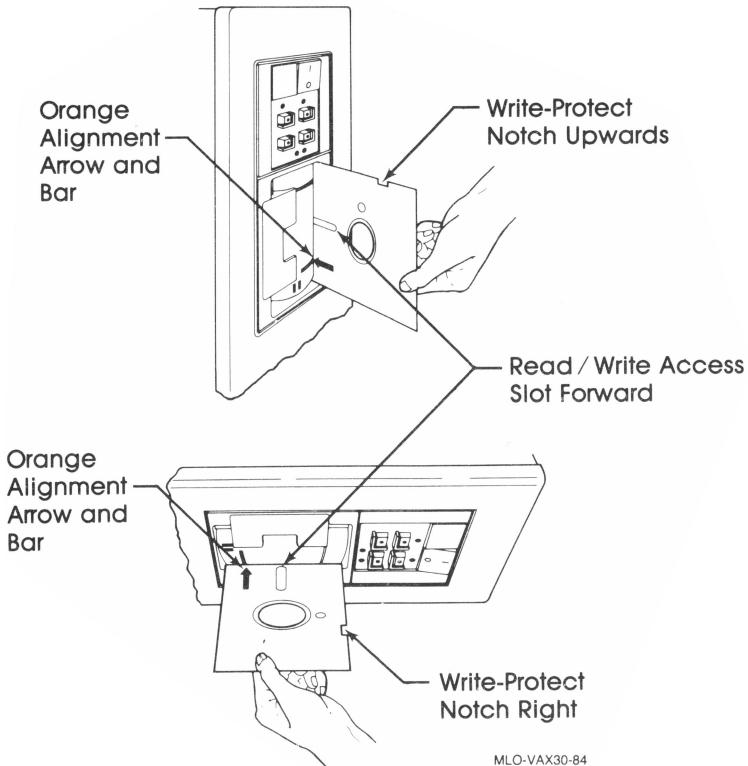


7. Remove the protective shipping cardboard insert from the diskette drive. Place the cardboard insert in a safe place. If you wish to move the equipment to another location, you will need to insert the card again.
8. Insert the diagnostic diskette into the open slot. Ensure that the orange arrow on the diskette lines up with the orange alignment bar on the drive. If the arrow and alignment bar are correctly aligned, the write-protect notch will be facing down or to your left.



MLO-VAX29-84

9. Insert the blank diskette into the other slot. Align the orange arrow with the alignment bar on the drive. The write protect notch will be facing down on the table-top version or to your right on the floor-standing one.



MLO-VAX30-84

10. Carefully close both doors. Do not use excessive force.
11. Press the **Restart** key on the front panel of the system unit. Macroverify will start running. In a few moments, the monitor screen will inform you of the status of the tests that Macroverify is performing. If you receive a message that a device is not present, check that you are supposed to have the device before you report a problem. If you receive any other message or if you receive no messages at all, see Part IV, Troubleshooting.

The following example shows a Macroverify run.

Macroverify V1.7

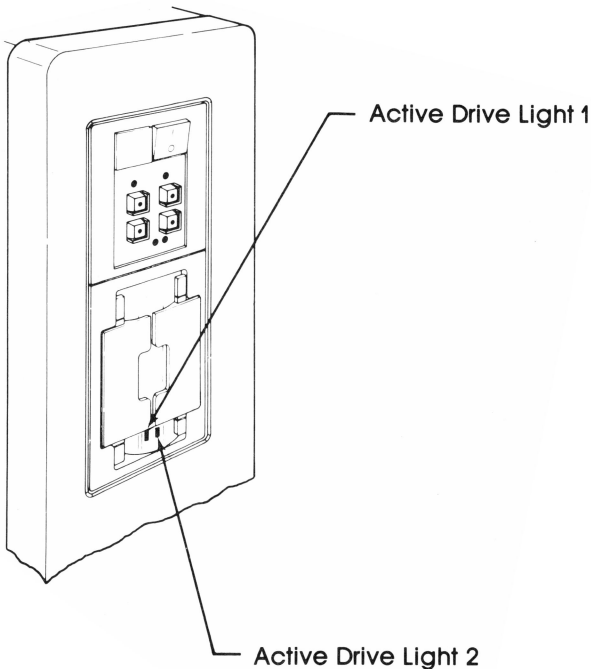
This MicroVAX I is at microcode revision level 5, hardware revision level 1,
and includes support for F-FLOAT and D-FLOAT data type.

<u>Testing</u>	<u>Time to</u> <u>Test (Mins)</u>	<u>Comments</u>
Memory	0:50	TEST SUCCEEDED (1.0 Mb)
Disk unit DUA0	0:20	TEST SUCCEEDED (RD52)
Disk unit DUA1	0:20	TEST SUCCEEDED (RD50)
Disk unit DUA2	0:20	TEST SUCCEEDED (RD50)
DLVJ1	0:40	DEVICE DLVJ1 WITH CSR 776500 NOT FOUND. NO TESTING PERFORMED.
DZV11	0:10	DEVICE DZV11 WITH CSR 760100 NOT FOUND. NO TESTING PERFORMED.
DEQNA	0:10	DEVICE DEQNA WITH CSR 774440 NOT FOUND. NO TESTING PERFORMED.
VCB01	0:10	TEST SUCCEEDED

Macroverify test completed.

Press RETURN key to enter console command mode_

12. When the Macroverify test is finished, wait for the active drive light, labelled "run," to go out, open the drive door, and remove the diskette. Return the diskette to its envelope and store the diagnostic kit in a safe place. You need only run the first diagnostic diskette at this time. If you encounter problems at any time, running the diagnostic diskettes may assist you in isolating the error. For more information on diagnostics, see Chapter 8.



MLO-VAX32-84

13. Store accessories and packaging in a safe place. If you wish to move the equipment to another location, you will require this packaging.
14. Hardware installation and testing are now complete.

WHERE TO GO FROM HERE

You are now ready to install software. Please proceed to Chapter 3.

3

Installing the VAXstation Software

This chapter describes how to install the MicroVMS Base System software and the Workstation Software (MicroVMS/VSI). You must install the MicroVMS Base System software on your RD52 disk and start MicroVMS before installing any other software. (The exception to this is any software that runs directly from diskettes, such as diagnostics.)

NOTE

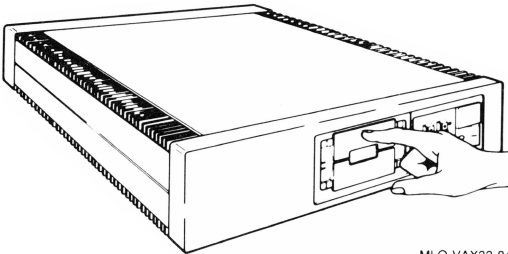
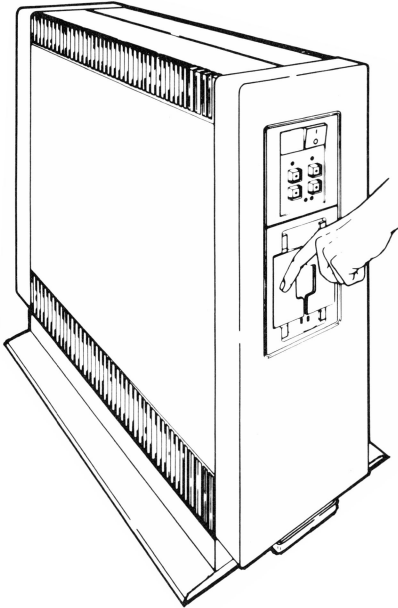
Your service representative will perform the initial installation of the MicroVMS Base System software and the Workstation Software.

LOADING DISKETTES

Before you install the software, please review the procedures for loading diskettes. Loading is the process of placing a diskette in the diskette drive and making the drive ready for use. The steps are as follows:

1. Check that the light next to the diskette drive door is not lit.
2. Remove the diskette from the paper envelope. The diskette is further protected by a sealed black jacket, **which you should not remove**. Do not touch exposed surfaces of the diskette.

3. Open the door to the drive that you want to use. To open drive 1, press the upper half of the top drive door (table-top versions) or the left half of the left drive door (floor-standing versions).



MLO-VAX33-84

To open the door to drive 2, press the bottom half of the bottom drive door (table-top versions) or the right half of the right drive door (floor-standing versions).

4. Align the diskette so that the orange arrow on the diskette points at the orange bar on the drive, and slide the diskette all the way into the slot.
5. Close the door gently.

Save your diskettes in a safe container away from heaters, direct sunlight, or magnetic fields, such as those created by motors, generators, and transformers. You may need to use the diskettes later to restore a component of the software. Chapter 4 contains additional details on diskettes.

INSTALLING MICROVMS

If you already have MicroVMS installed, go to the **STARTING THE SYSTEM** section.

It takes about 30 minutes to install MicroVMS. You install MicroVMS in two stages.

In the first stage, you install two stand-alone backup diskettes (SABKUP 1/2 and SABKUP 2/2). You leave the second diskette in the drive for the second stage.

In the second stage, you install the base software contained on 11 diskettes (MicroVMS BASE 1/11 to 11/11).

CAUTION

Installing MicroVMS destroys the existing contents of the fixed disk. If this is not the first installation of the Base System software, back up your user files before proceeding; restore the files after the installation. (See Chapter 1 of the *MicroVMS User's Manual* for information on backing up files.)

To install the Base System software, take the following steps:

1. Locate the diskettes for stand-alone backup and the Base System: "SABKUP 1/2," "SABKUP 2/2," and the eleven "MicroVMS BASE" diskettes.
2. If the VR100 monitor (console) is not on, press its power switch to the on (1) position.
3. If the system unit is not on, press its power switch to the on (1) position. On the front control panel, the **Ready** pushbutton should be in and glowing. The DC OK indicator should be glowing. The **Halt** and **Write-Protect** pushbuttons should be out and not glowing.
4. Load the first stand-alone backup diskette, labeled "MicroVMS V4.0 SABKUP 1/2" in drive 1 (the top or left drive).
5. Press the **Halt** pushbutton on the system unit control panel twice. That will put the system in console mode.
6. When the console prompt (>>>) appears, type the following **BOOT** command and press **Return**:

```
>>> B DUA1
```

NOTE

If you have the free-standing disk option described in Chapter 6 installed, type DUA2 instead of DUA1.

After you enter the **BOOT** command, the message **ATTEMPTING BOOTSTRAP** appears, followed in about 20 seconds by a message stating the version number of the operating system. After another 20 seconds, you are prompted for the date and time.

PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM)

The format for entering the date and time is shown in parentheses. Before you enter the date and time, read the following information about format.

The mnemonics have the following meanings:

Mnemonic	Meaning
-----------------	----------------

DD	Day of the month (one or two digits)
MMM	Month (first three letters of the month's name)
YYYY	Year (four digits)
HH	Hour of the day in 24-hour format (one or two digits)
MM	Minute of hour in two digits

You must be exact in the format or you will be reprompted. The hyphens, space, and colon must appear as shown. For example, Nov 23, 1984 at 3:30 P.M. is typed as:

23-NOV-1984 15:30

You do not have to be exact in the value of the date and time. However, try to be as close as possible. Otherwise, file activity and other events will not be recorded properly.

7. Now enter the current date and time and press **Return**.
8. When you see the message, "Please remove volume 'SYSTEM_1' from the console device," remove and store the diskette from drive 1.
9. When you see the message "Insert the first stand-alone application volume and enter 'Yes' when ready," load the second stand-alone backup diskette, labeled "MicroVMS V4.0 SABKUP 2/2" in drive 1. When the diskette is loaded, type the letter **Y** and press **Return**.

Some messages are displayed. After about 20 seconds, the **DCL** (DIGITAL Command Language) prompt (\$) appears. Leave the second stand-alone backup diskette in drive 1 for the remainder of the installation.

NOTE

If the installation fails for any reason, you must start again from the first stand-alone backup diskette. For example, if the power cord is accidentally unplugged, a diskette is loaded improperly or in the wrong sequence, or a wrong response is typed, you must start over.

However, if you loaded the wrong diskette, but did not yet type the letter Y, you can remove that diskette and load the proper one without starting over from the beginning.

10. Load the diskette labeled "MicroVMS V4.0 BASE 1/11" in drive 2 (the bottom or right drive). Type the following command and press **Return**:

```
$ BACKUP/VERIFY/INITIALIZE DUA2:MICROVMS/SAVE_SET DUA0:
```

Note the underscore in SAVE_SET; do not use a dash or hyphen. If you have the free-standing disk option installed, type DUA3: instead of DUA2:.

11. In about one minute, a message is displayed telling you that the verification pass is starting. The backup operation will continue. Wait for the prompt for the next diskette:

```
%BACKUP-I-RESUME, Resuming operation on volume 2
%BACKUP-I-READYREAD, Mount volume 2 on SABKUP$DUA2: for
reading
Enter 'YES' when ready
```

Before typing a response, unload the diskette from drive 2. Load the diskette labeled "MicroVMS BASE 2/11" in drive 2. Type Y and press **Return**. Verification and mount messages will again be displayed.

12. Repeat the process described in the previous step for the remaining MicroVMS diskettes in order through "MicroVMS V4.0 BASE 11/11." Each diskette takes about 90 seconds to process.

When the installation is complete, the DCL prompt (\$) appears. Unload the MicroVMS diskette from drive 2 and unload the second stand-alone diskette from drive 1.

STARTING THE SYSTEM

Once MicroVMS is installed, you must go through the following steps before you can install the Workstation Software.

1. Press the **Halt** pushbutton on the system unit control panel twice.

2. Type the following response to the console prompt (>>>) and press **Return**:

```
>>> B/1 DUA0
```

The SYSBOOT> prompt appears.

3. Enter SHOW SPTREQ after the SYSBOOT> prompt and press **Return**. The value of the parameter is displayed. For example:

```
SYSBOOT> SHOW SPTREQ
```

<u>Parameter Name</u>	<u>Current</u>	<u>Default</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Unit</u>	<u>Dynamic</u>
SPTREQ	896	896	-1	-1	Pages	

4. Write down the current value of the SPTREQ parameter. In the above example, the current value is 896.
5. Add 700 to the current value.
6. Enter the result with a SET SPTREQ command and press **Return**. For example:

```
SYSBOOT> SET SPTREQ 1600.
```

7. Enter an EXIT command and press **Return**.

```
SYSBOOT> EXIT
```

The system will automatically boot and display a prompt for the date and time.

8. Enter the date and time in the format requested.
9. Wait several minutes while the system starts up. Several messages will appear on the screen, starting with

```
The MicroVMS system is now executing the site-specific
startup commands.
```

and ending with a "job terminated" message.

INSTALLING THE WORKSTATION SOFTWARE

It takes about 12 minutes to install the Workstation Software. Follow these steps:

1. Locate the Workstation Software diskettes, labeled "VSI010 1/2" and "VSI010 2/2."
2. If MicroVMS is not running, press the **Restart** pushbutton on the system unit control panel, enter the date and time when requested, and wait for the "job terminated" message.
3. Press **Return**. The Username: prompt appears.
4. Log in to the system manager's account by typing SYSTEM and pressing **Return**. For example:

```
Username: SYSTEM
```


NOTE

1. If a password has been set for the system account, you will also be prompted for the password.
2. If you have already installed other applications, check to see that the following requirements are met:

- 1400 blocks of free disk space (minimum during installation). 1200 blocks of disk space will be used after installation. To determine the free disk space, use the SHOW DEVICE DUA0: command and check under Free Blocks. If there are not enough free blocks, you have to remove some other applications in order to install the Workstation Software.
- User Account Quota

Open Files:	16 files (minimum)
Paging File:	1500 pages (minimum)
Working Set Size	250 pages (minimum)
	400–500 pages (optimum)

Subprocess Creation by user requirement

To find out the Paging file quota and Open file quota for your account, use the SHOW PROCESS/QUOTA command. To find out the size (Authorized quota) for the working set, use the SHOW WORKING—SET command.

You can change these values using the AUTHORIZE utility. Consult Chapter 2 of the *MicroVMS User's Manual* for details.

5. Invoke VMSINSTAL by entering the following and pressing **Return**:

```
$ @SYS$UPDATE:VMSINSTAL VSI010 ddn:
```

ddn: is the device name of the drive from which you are installing. On the basic VAXstation configuration, the diskette device names are DUA1: and DUA2: for diskette drives 1 and 2 respectively. (If you have installed the free-standing disk drive, the diskette device names are DUA2: and DUA3: for drives 1 and 2 respectively.)

From this point on, it takes about 10 minutes to install the Workstation Software. First, the system responds with a display. For example:

```
VAX/VMS Software Product Installation Procedure, V4.0
It is 5-OCT-1984 at 9:36
Enter a question mark (?) at any time for help.
Are you satisfied with the backup of your system disk
[YES]?
```

6. If this is the first time you are installing MicroVMS and the Workstation Software, you do not need to back up your system disk; therefore, type Y and press **Return** to continue installing the software.

The system responds with a message.

```
Please mount the first volume of the set on DUAn:
```

```
Are you ready?
```

n is the number of the drive from which you are installing.

7. Load the diskette labeled "VSI010 1/2" into the diskette drive.
8. Type Y and press **Return**. A verification message is displayed.

```
%MOUNT-I-MOUNTED, VSI010 mounted on _DUAn:
```

n is the number of the drive from which you are installing.

More messages appear on the screen. At times there will be pauses while the system installs the software. Then the following message appears:

```
%BACKUP-I-READYREAD, mount volume 2 on DUAn: for reading.  
Enter "YES" when ready:
```

n is the number of the device on which you loaded the first diskette.

9. Remove the first diskette and store it in its envelope.
10. Load the Workstation Software diskette labeled "VSI010 2/2" into the diskette drive indicated on the screen.
11. Type Y and press **Return** to indicate that you are ready for the second diskette to be installed.
12. Wait while the system begins the installation process. Then the following message appears:

```
Installing uVMS VAXstation I graphics/windowing software...
```

From this point on, it takes about 10 minutes for the software to be moved to directories on the disk. You will see several messages on the screen, including some AUTOGEN messages indicating that certain parameters are being changed so that the Workstation Software can be used.

13. Wait while the files are moved to the fixed disk. When the process is completed, the system shuts down automatically.
14. Press the **Restart** pushbutton on the system unit front control panel. The system reboots, and displays the date and time prompt.
15. Remove and store the second Workstation Software diskette.
16. Enter the date and time in the format requested and press **Return**.

NAMES OF WORKSTATION SOFTWARE FILES INSTALLED

The following files are installed with the Workstation Software:

- **Workstation Software base files**

```
SYS$SYSROOT:[SYSEXE]VCDRIVER.EXE
SYS$SYSROOT:[SYSEXE]CSDRIVER.EXE
SYS$SYSROOT:[SYSEXE]WTDRIIVER.EXE
SYS$SYSROOT:[SYSEXE]TKDRIVER.EXE
SYS$SYSROOT:[SYSEXE]UISLOA.EXE
SYS$SYSROOT:[SYSEXE]UISINIT.EXE
SYS$SYSROOT:[SYSEXE]UISMEMFONTS.DAT
SYS$SYSROOT:[SYSEXE]UISBG.EXE
SYS$SYSROOT:[SYSLIB]UISSHR.EXE
SYS$SYSROOT:[SYSHLP]UISHELP.HLB
SYS$SYSROOT:[SYSMGR]STARTQVSS.COM
```

- **Workstation Software font files**

A new directory is created that contains several font files. The directory name is:

```
SYS$SYSROOT:[SYSFONT]
```

AUTOMATIC SCREEN BLANK OUT FEATURE

To reduce CRT wear, once the Workstation Software is installed, the screen display will go off after 15 minutes of nonuse. Move the mouse or press any key, for example, **Shift**, to turn the screen display back on. (This does not affect the power; it remains on until manually switched off.)

WHERE TO GO FROM HERE

Once you have the MicroVMS Base System software and the Workstation Software installed, read Chapters 4 and 5. Chapter 5 contains essential information about using the VAXstation I software. Then proceed to the *MicroVMS User's Manual*.

Information about installing the rest of the MicroVMS software is in the *MicroVMS User's Manual*. Information about installing the GKS software is in the GKS documentation.

4

VAXstation I Hardware

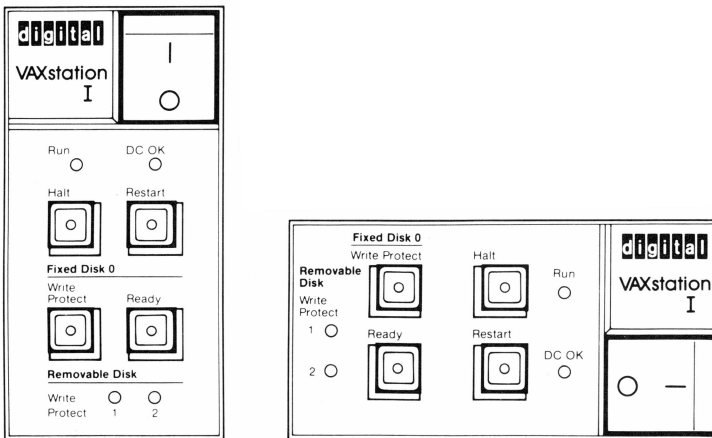
This chapter describes the VAXstation I basic hardware and how to operate it. The following topics are covered:

- System unit controls and indicators
- RX50 and RD52 diskette drives
- VR100 monitor controls and indicators

THE SYSTEM UNIT CONTROLS AND INDICATORS

The front control panel contains the following status controls and indicators:

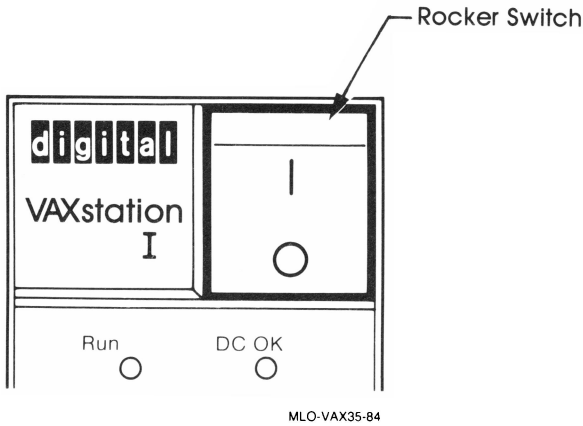
- System power switch
- Halt pushbutton
- Restart pushbutton
- Fixed disk write-protect pushbutton
- Fixed disk ready pushbutton
- Run indicator
- DC OK indicator
- Removable disk write-protect indicators



MLO-VAX34-84

Figure 4-1: Controls and Indicators

The System Power Switch

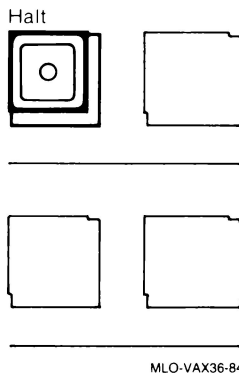


This rocker switch turns the ac power on and off. Setting the switch to 1 turns the power on. The switch illuminates orange. Microverify automatically executes.

The **DC OK** indicator glows green if all dc voltages are present and within tolerance. The **Run** indicator glows green when the computer is executing instructions.

Setting the switch to 0 turns off the power.

The Halt Pushbutton



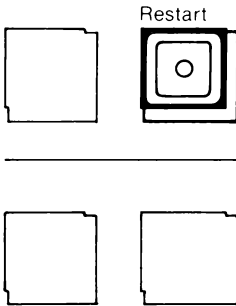
The **Halt** pushbutton stops the program currently running without shutting down the VAXstation I.

When the **Halt** button is pushed in, it latches and illuminates orange. You must press it again to release it and enter console mode; only console com-

mands may be issued. See Appendix A for a description of the console commands.

User programs may be run when the **Halt** button is out. You may issue a CONTINUE, START, or SINGLE MACROINSTRUCTION STEP console command to enter program mode.

The Restart Pushbutton



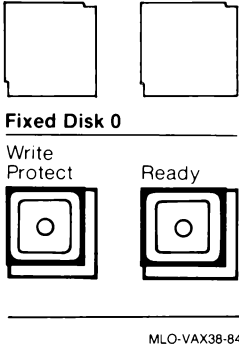
MLO-VAX37-84

The **Restart** pushbutton is a momentary control to reboot computer operation. Pressing **Restart** has no effect if the **Halt** pushbutton is latched in.

The default restart action is an attempt to restart a suspended program (this is termed a warm start). If this fails, a bootstrap is attempted (this is termed a cold start). Bootstrapping attempts to copy an image of the system into memory. If both actions fail, a halt is executed and the system enters console mode. See Appendix A.

When the **Restart** button is pushed, a power down/power up sequence is simulated on the Q22 bus. Take care to restart at an appropriate time with regard to your software, for example, when no program is in progress.

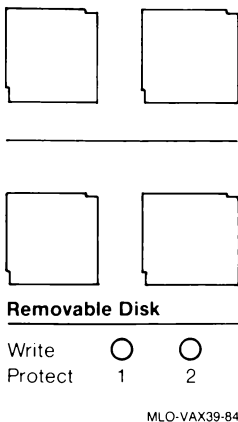
The Fixed Disk Pushbuttons



The **Fixed Disk Write-Protect** pushbutton prevents data from being written to the fixed disk. When pushed in, the pushbutton glows orange, indicating that the fixed disk is write protected. This safety feature helps prevent data from being accidentally erased. The disk can still be read. When the pushbutton is out, the disk is write enabled.

The **Fixed Disk Ready** pushbutton prevents data from being written to or read from the fixed disk until you are ready. When the pushbutton is out it glows green, indicating that the fixed disk is available for read or write operations. When pushed in, the light extinguishes, indicating that the fixed disk is unavailable for read and write operations. The light blinks rapidly during disk activity.

The Removable Disk Write-Protect Indicators

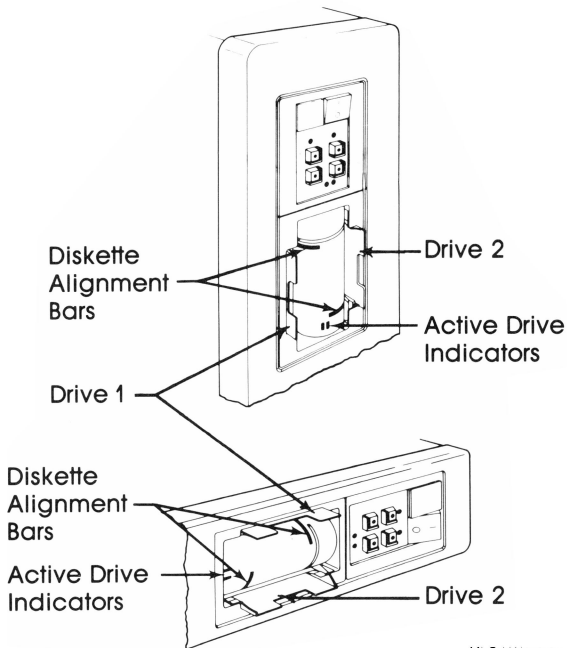


These Light Emitting Diode (LED) indicators glow when the diskette in the corresponding drive is write protected. When the diskette in the top or left

drive is write protected, the **LED** marked 1 is lit. When the diskette in the bottom or right drive is write protected, the **LED** marked 2 is lit. It is still possible to read from diskettes that are write protected. For information about write protecting diskettes, see the section titled "Protecting Diskettes from Accidental Overwriting" in this chapter.

THE RX50 DISKETTE DRIVE

Alongside the control panel is the RX50 diskette drive. It can hold two diskettes. Two access slots with locking doors enable you to load and unload diskettes. The top or left slot is designated drive 1 and the bottom or right slot is designated drive 2.

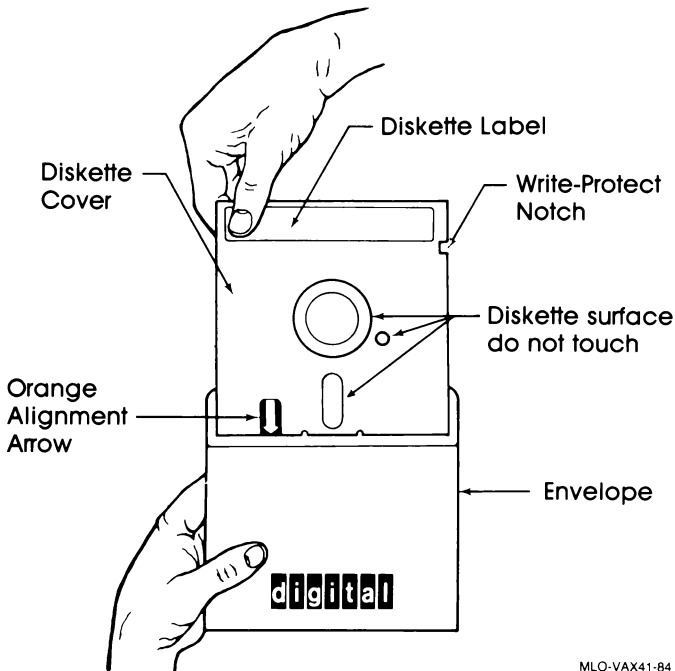


MLO-VAX40-84

Figure 4-2: The RX50 Diskette Drive

RX50 Recording Medium

The RX50 drive records data on 5.25-inch (13.34 cm) diskettes. The diskette is permanently enclosed in a protective jacket. When not in use, the diskette should be kept in its envelope. The diskettes must be formatted according to standards established by DIGITAL. Each diskette can store 400K-bytes of formatted data.



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Figure 4-3: RX50 Recording Medium

Diskette Handling and Storage

Incorrect handling and storage of diskettes can result in damage to the diskette (and/or the RX50 recording head) and in the eventual loss of data. The following points should be observed:

- Always keep the diskette in the protective envelope when the diskette is not in use.
- Do not fold or bend the diskette jacket.
- Do not touch the recording surfaces of the diskette. When out of its envelope, only the top (label area) of the diskette should be handled.
- Store the diskette upright (with the label at the top) in proper storage containers.
- If possible, the diskette should be labeled with prewritten labels. If you need to change the label, use a felt-tipped pen to avoid damaging the diskette.

- Do not store the diskette in direct sunlight or near heaters. The temperature should not fall below 50° F (10° C) or rise above 125° F (52° C).
- Store the diskette away from strong magnetic fields, and do not let it touch any steel objects. Any magnetic fields (produced by motors, generators, and transformers) can erase data.

Protecting Diskettes from Accidental Overwriting

The RX50 has a write-protect feature to prevent loss of data by accidental overwriting. To protect the diskette, the write-protect slot on the side of the protective jacket is covered to prevent overwriting. Diskettes are supplied with a packet of adhesive-backed write-protect tabs.

Remove the tab when you want to write data on the diskette.

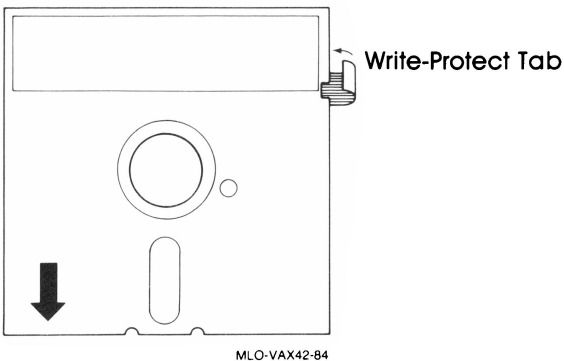
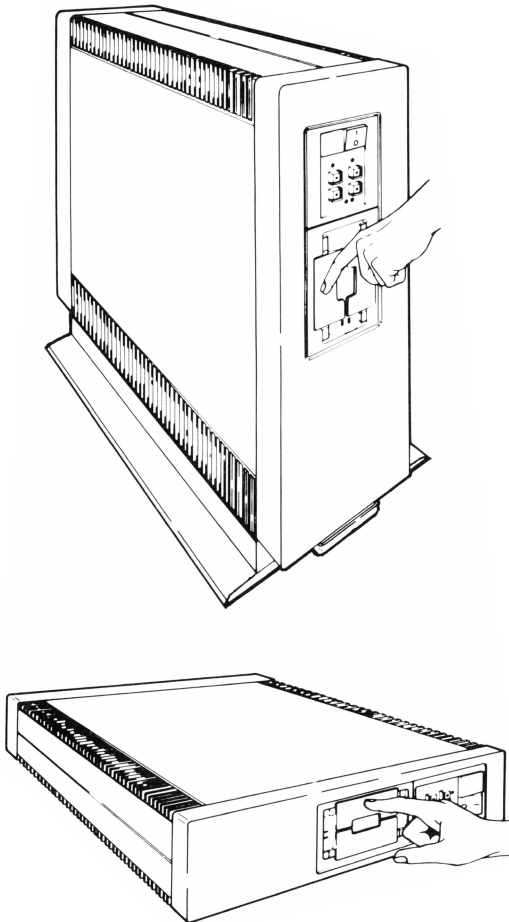


Figure 4-4: Write Protecting Diskettes

Opening Drive Doors

Do not attempt to open a door while the active drive light is on as this might damage the drive heads. You must wait for the light to go off which indicates disk activity has finished, or perform the procedures described in your software documentation to shut the drive down.

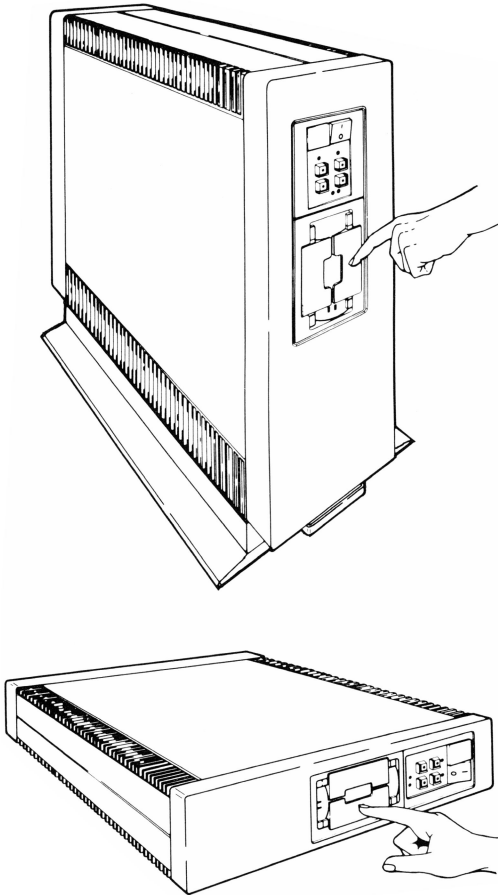
To open the door to drive 1, press the upper half of the top drive door (table-top versions) or the left half of the left drive door (floor-standing versions).



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Figure 4-5: Opening Drive Door 1

To open the door to drive 2, press the bottom half of the bottom drive door (table-top versions) or the right half of the right drive door (floor-standing versions).



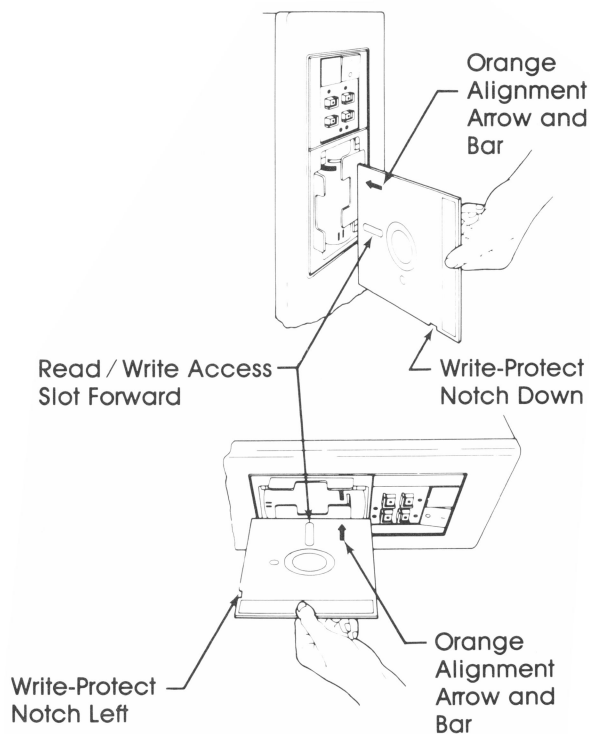
MLO-VAX44-84

Figure 4-6: Opening Drive Door 2

Inserting Diskettes

Do not attempt to load or unload a diskette while the active drive light for a slot is on as this might damage the drive heads.

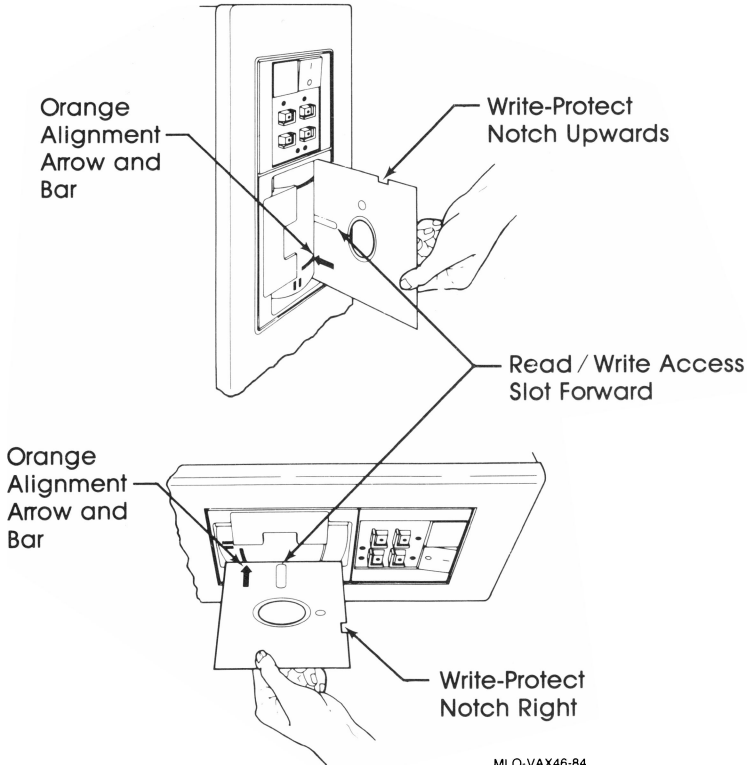
To insert a diskette into drive 1, ensure that the write-protect notch is on your left (table-top versions) or facing down (floor-standing versions). On diskettes made by DIGITAL, an orange arrow on the diskette lines up with the orange alignment bar on the drive.



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Figure 4-7: Inserting a Diskette into Drive 1

To insert a diskette in drive 2, ensure that the write-protect notch is on your right (table-top versions), or facing up (floor-standing versions). On diskettes made by DIGITAL, an orange arrow on the diskette lines up with the orange alignment bar on the drive.

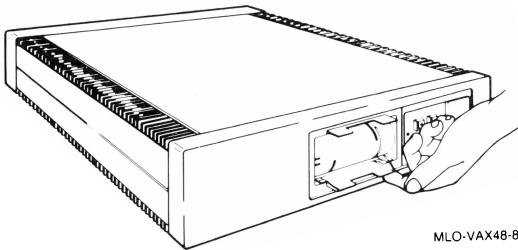
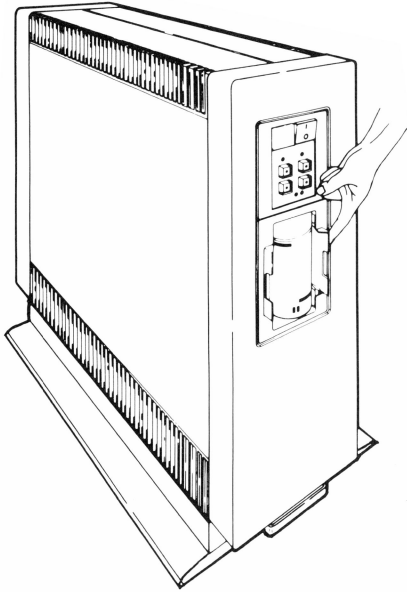


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Figure 4-8: Inserting a Diskette into Drive 2

Closing the Drive Doors

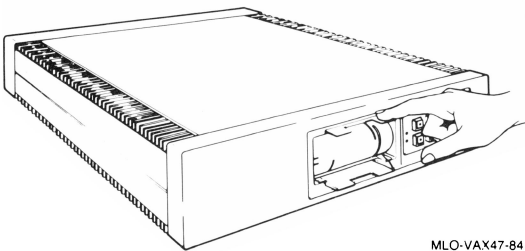
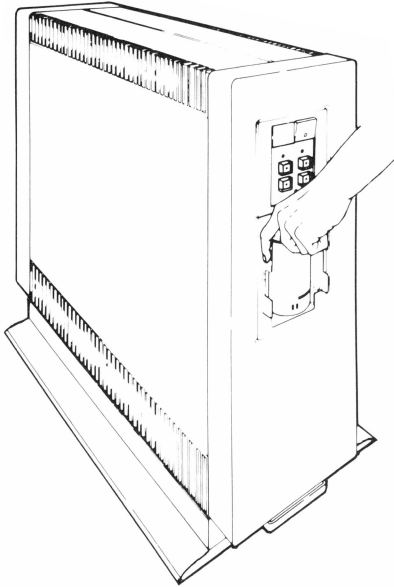
Close the door to drive 1 by carefully pushing down on it (table-top versions) or by pushing it to the right (floor-standing versions) until it is flush with the front cover. Do not use excessive force; the door should close easily. Always close the door after inserting a diskette or after removing one.



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Figure 4-9: Closing Drive Door 1

Close the door to drive 2 by carefully lifting it up (table-top versions) or by pushing it to the left (floor-standing versions) until it is flush with the front cover. Do not use excessive force; the door should close easily. Always close the door after inserting a diskette or after removing one.

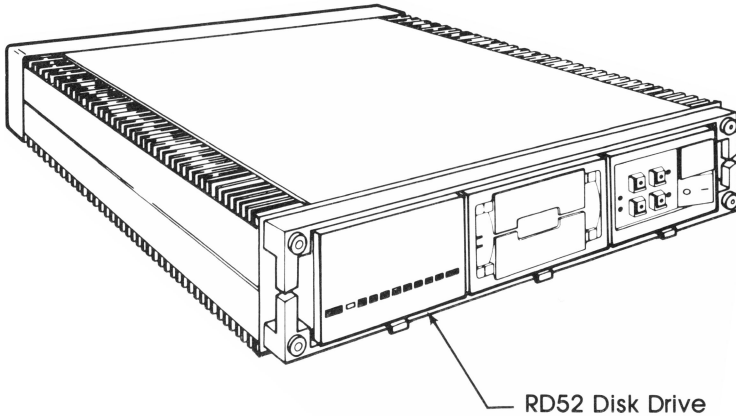


MLO-VAX47-84

Figure 4-10: Closing Drive Door 2

THE RD52 DISK DRIVE

Alongside the RX50 diskette drive is the RD52 winchester fixed disk drive. Located behind the system unit front cover, the capacity of the RD52 is 28M-bytes of formatted data.



MLO-VAX49-84

Figure 4-11: RD52 Drive

THE VR100 MONITOR CONTROLS AND INDICATORS

The display monitor used with the VAXstation I weighs 44.1 lb (20 kg), has a self-contained power supply, and requires a line input of 120/240 Vac 50/60 Hz at 100 watts.

The monitor uses a 19 inch, diagonal (48.3 cm) monochrome CRT. The screen resolution is 960 horizontal X 864 vertical pixels, with a spot size of 0.010 inch (0.254 mm). The screen display dimensions are 13.95 inch (354.3 mm) horizontal and 11.08 inch (281.4 mm) vertical, the aspect ratio of 1.13:1.

The monitor has the following controls and indicators:

- External controls:
 - Contrast
 - Brightness
- Indicators:
 - Power
 - Video
 - Hsync
 - Vsync

- Internal controls:

- Horizontal and vertical centering
- Horizontal and vertical linearity
- Width and height
- Horizontal frequency and vertical hold
- Horizontal dynamic focus and vertical dynamic focus
- Static focus

The external controls and indicators are located on the back of the monitor.

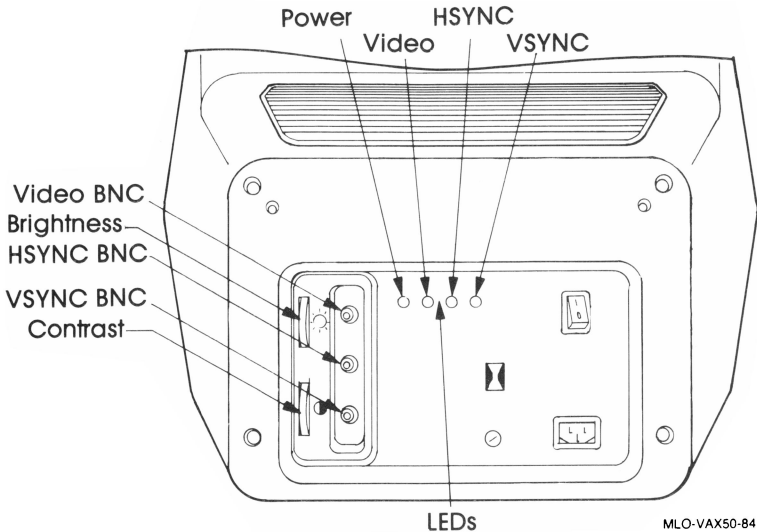


Figure 4-12: VR100 External Controls and Indicators

Use the contrast control if you are not satisfied with the contrast in tone on the monitor display. Use the brightness control to increase or decrease the brightness of the monitor display.

The four indicators are normally lit when the monitor power switch is turned on. (However, the video may appear to be off when only one or two lines are displayed on an otherwise black screen.) If one of the indicators goes off, a failure is indicated. Contact your service representative for assistance.

The internal controls on the monitor do not normally have to be adjusted. If you think that an adjustment is necessary, contact your service representative.

5

Getting Started Using the VAXstation I

Read this chapter before you start using your VAXstation I. This chapter assumes that you have already installed your Workstation Software as described in Chapter 3.

TURNING ON THE VAXSTATION I

Turn your VAXstation I off when not in use for long periods, for example, overnight or weekends.

To turn the system back on, follow these steps:

1. Press the power switch on the monitor (the 1/0 switch) to the 1 position.
2. Press the power switch (the 1/0 switch) on the system unit to the 1 position. The system starts up and prompts you for the date and time.

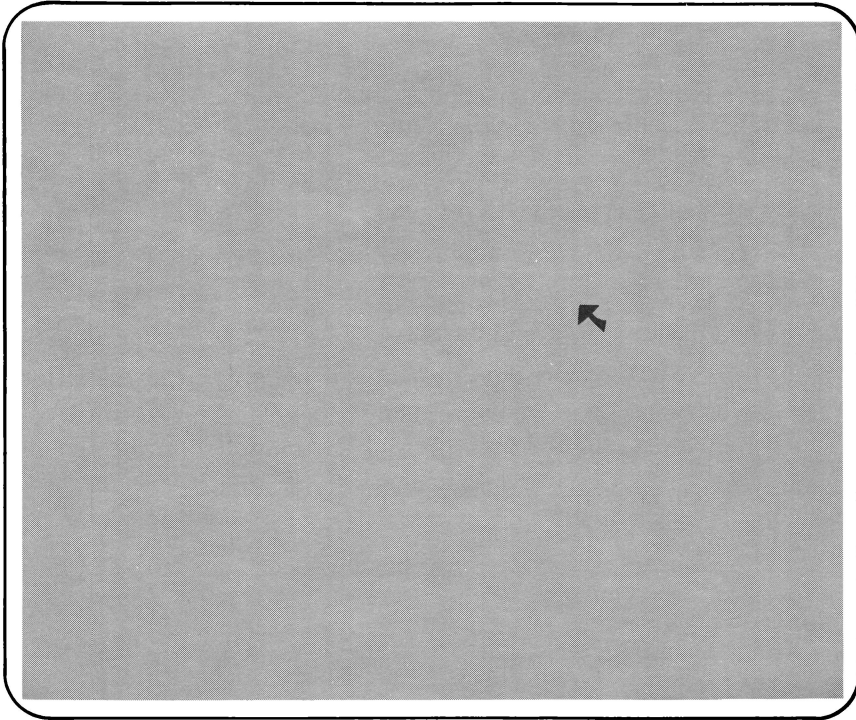
MICROVERIFY STARTED

MICROVERIFY PASSED
ATTEMPTING REBOOT

VAX/VMS Version 4.0 20-SEP-1984 08:31

PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM)

3. Enter the date and time in the format requested and press **Return**. A series of startup messages appear, ending with a "job terminated" message. Then the screen display will change to a shaded area with a black pointer.



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SCREEN SAVER

To prevent screen wear, the screen display goes off after 15 minutes of nonuse. Move the mouse or press any key, for example, **Shift**, to renew the display.

To modify the period of nonuse, use the "Screen saver period" option on the Workstation Setup menu, described later in this chapter.

MOVING THE POINTER

You control the pointer on the screen with the mouse. Before you try to use the mouse, rest it on a piece of paper — letter-size paper or bigger is suitable. The mouse works best on paper or cardboard, but can be used on any surface.

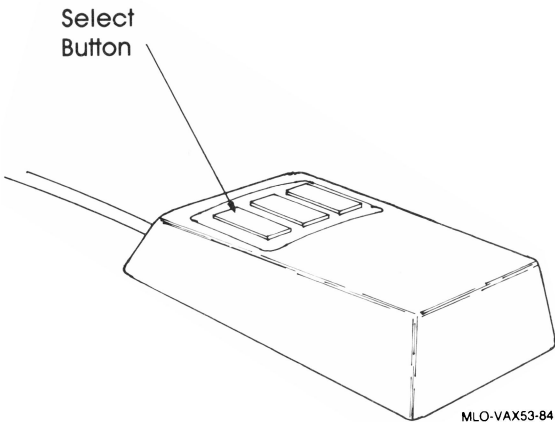
Now, without touching any of the buttons on the mouse, slowly move the mouse around the paper and watch the pointer move. Notice that if you move the mouse quickly, the pointer moves fast. Move the mouse with a steady motion, pressing on the narrow end with your palm.

If you come to the edge of the paper, pick up the mouse, put it further back on the paper, and then continue moving the mouse in the same direction. With a little practice, you will soon have control over the pointer movement.

Once you feel comfortable moving the pointer, you need to know about the two ways of using the mouse select button.

THE SELECT BUTTON: HOLD DOWN AND CLICK

The leftmost button on the mouse is the select button, used to control windows on the screen.



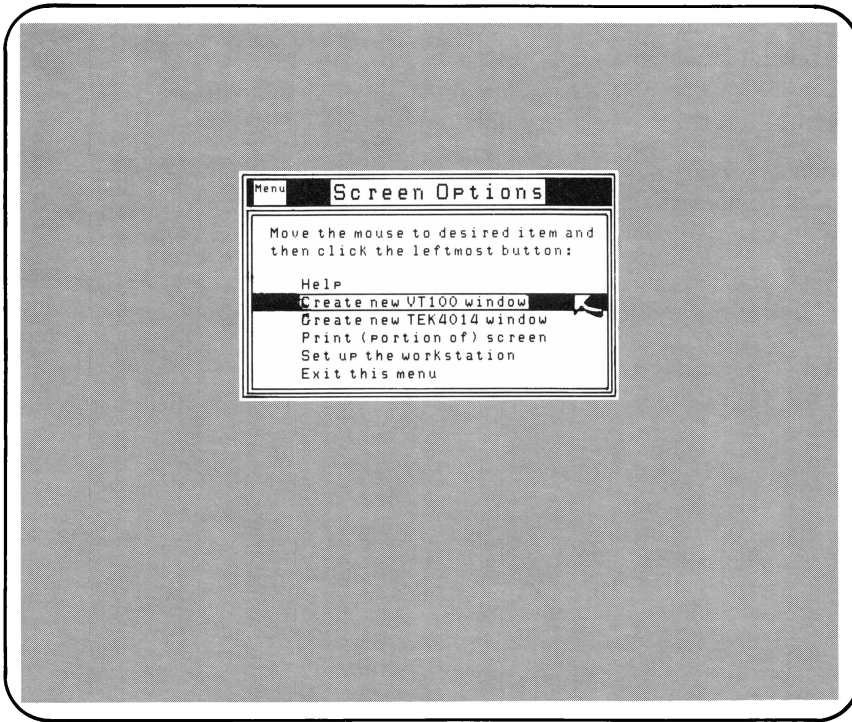
The two ways to use this button are: 1) hold down and 2) click. Make sure you use the button the way you are instructed to in the following sections.

Hold Down — Press and hold the select button, move the mouse, and then release the button.

Click — Press and release (click) the select button.

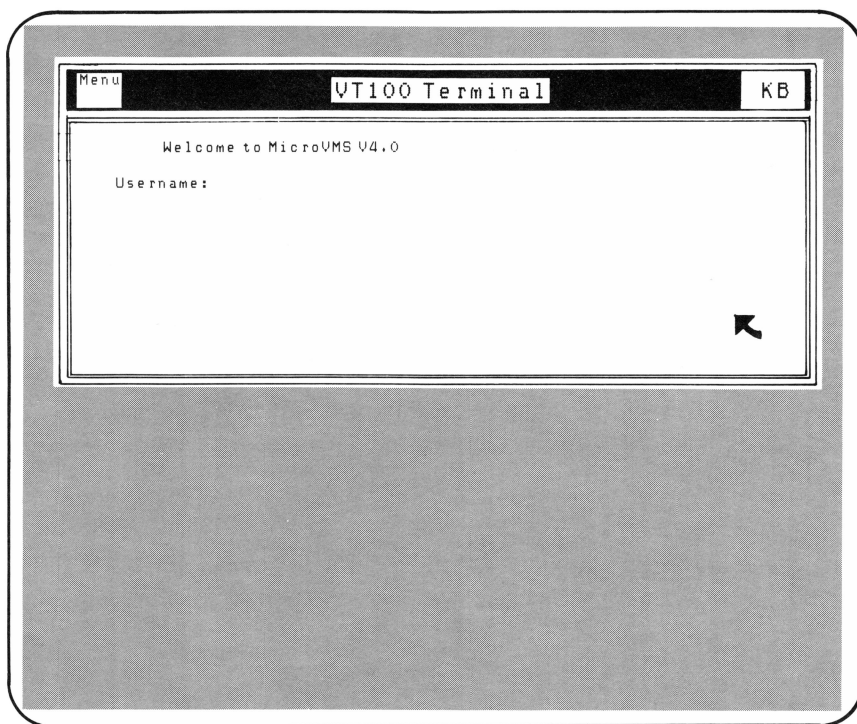
THE SCREEN OPTIONS MENU

With the pointer in the area shaded by vertical lines, click the select button on the mouse to display the Screen Options menu.



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To select an option, move the pointer to the option until the contrasting bar is over the desired option. Then click the select button. Practice by selecting "Create a VT100 window."



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The prompt `Username:` appears for you to log in. To practice using VT100 emulation, type `USER` and press **Return**. By default, you have 30 seconds to log in before the window disappears. (You can change this time later if you want. Refer to the *MicroVMS User's Manual* for details.)

Notice that the VT100 emulation window has a black banner at the top. The `KB` at the top right indicates that the keyboard is connected to that window or process.

You can create as many windows on the screen as your system resources allow. For example, you can select "Create a VT100 window" several times, each time logging in on the same or different accounts. Each time you log in, MicroVMS creates a process. Windows can overlap other windows, but each process will remain active.

HELP

To display information about the VAXstation I, select "Help" from the Screen Options menu. A list of topics appears. To read about a topic, type its name and press **Return**. You can abbreviate to the first few characters that uniquely identify the topic.

To redisplay the topics while Help is running, type a question mark (?) and press **Return**.

To exit HELP and delete the Help window, type EXIT and press **Return**.

CONNECTING THE KEYBOARD TO A PROCESS

You can run different programs on different processes in different windows, all at the same time; **but** the keyboard can only be used with one process at a time. The letters KB on the banner indicate which process is currently connected to the keyboard.

To change the connection to another process, use the mouse as follows:

1. **Without** pressing on any mouse button, move the pointer to the banner (or any point on the border) of the window containing the process you want.
2. Click the select button.
3. The letters KB appear on the banner, showing that you can use the keyboard to control that window. If that window was underneath other windows, it *pops* to the top, so that you see the entire window.

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To display information about the VAXstation I, select "Help" from the Screen Options menu. A list of topics appears. To read about a topic, type its name and press **Return**. You can abbreviate to the first few characters that uniquely identify the topic.

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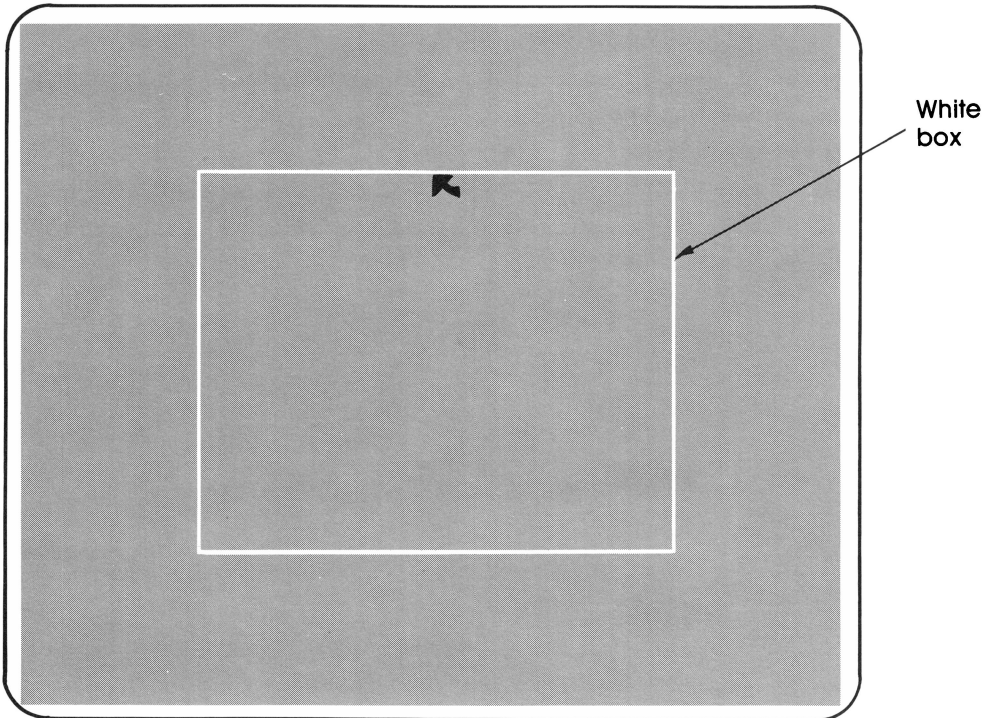
To change the connection to another process, use the mouse as follows:

1. **Without** pressing on any mouse button, move the pointer to the banner (or any point on the border) of the window containing the process you want.
2. Click the select button.
3. The letters KB appear on the banner, showing that you can use the keyboard to control that window. If that window was underneath other windows, it *pops* to the top, so that you see the entire window.

MOVING A WINDOW

To move a window to a different part of the screen:

1. Move the pointer to the banner (or any point on the border) of the window.
2. Press the select button and hold it down.
3. The window display disappears, leaving a white outline of the window.



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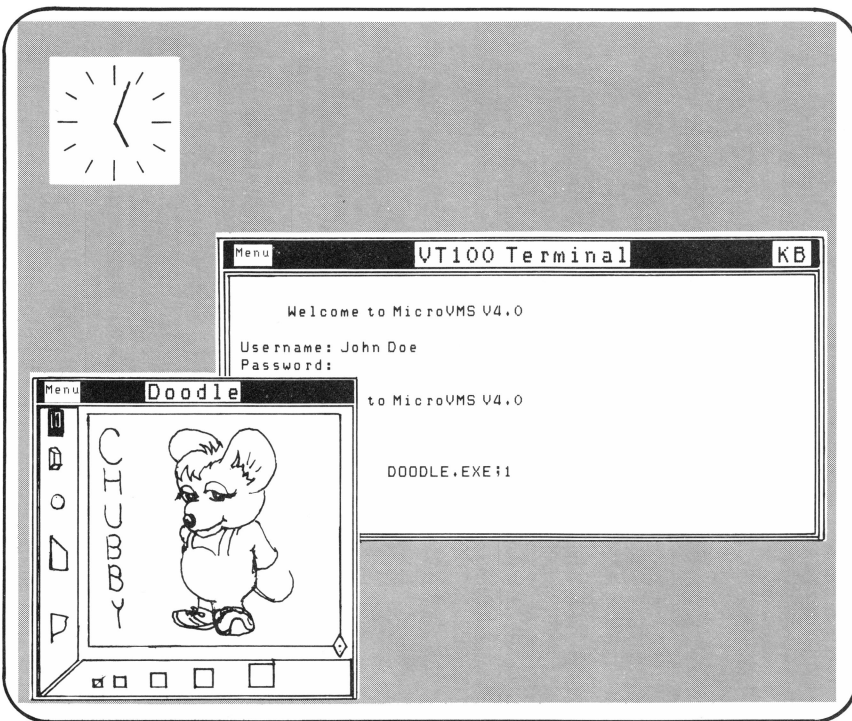
4. Move the pointer steadily until the window is where you want it.
5. Release the select button. The window display reappears in the new place.

You can move a window so that only part of it appears on the screen. However, some part of it must remain visible.

PRINTING A PORTION OF THE SCREEN DISPLAY

If you have an LA50 or LA100 printer connected to the console port on your system unit, you can print any rectangular portion of the screen display as follows:

1. Make sure that your printer is turned on and that the paper is properly loaded.
2. Select "Print (portion of) screen" from the Screen Options menu, using the mouse. A diamond appears on the screen.
3. By moving the mouse, move the diamond to a corner of the rectangular area that you want to print.
4. Click the select button.
5. Move the mouse to create a box around the area that you want to print.



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6. When the box surrounds the area that you want printed, click the select button again. The printer will begin printing.

PRINTING FILES AT YOUR LOCAL PRINTER

The device name for the optional console printer is CSA0:. While in VT100 emulation, you can queue files to your local printer if you first install the Secure User Environment Option and set up one or more print queues as described in the *MicroVMS User's Manual*.

Another method of printing is to copy your file(s) to CSA0: using the copy command. For example:

```
$ COPY MYFILE.TXT CSA0:
```

VAXSTATION I CONTROL KEYS

The F1, F2, F3, and F5 control keys on the upper left of the keyboard are used for the following functions:

F1 — Hold Screen — Pressing this key keeps the entire screen display from changing and stops all process action until the F1 key is pressed again.

F2 — Console Display — Pressing this key displays at the top of the screen any messages sent to the console device (OPA0:). For example, if you tried to print a file and the printer was turned off, the software would send a message to the console device. Any time you want to see what messages have been sent, press the F2 key.

To erase the console display, press the F2 key again.

NOTE

When a message is sent to the console device, the console display automatically appears and the keyboard automatically connects to the console. You must press the F2 key to erase the display.

F3 — Switch Windowing System — If you have an alternate windowing system for custom applications that use the QIO device driver interface rather than the MicroVMS windowing system, pressing this key switches between windowing systems.

F5 — Change Active Window — Press this key to *cycle* through multiple windows created on the screen. (Only windows that can be connected to the keyboard can become active.) Each time you press the key, another window pops to the foreground of the display to become the currently active window. The KB appears in the window banner. Windows cycle in the order they were created, beginning with the current window.

The F4 key is reserved for future use.

WINDOW OPTIONS MENU

Use the Window Options menu to *push* a window to the background or pop a window to the foreground. To select the Window Options menu, move the pointer to the menu icon in the banner of the window that you want to change. A menu appears with the following options:

Put this window behind other windows — Selecting this option causes the selected window to move to the background of the display, in other words, under any window it was covering.

Put this window in front of other windows — Selecting this option causes the selected window to move to the foreground of the display.

Exit — Selecting this option erases the Window Options menu.

VT100 TERMINAL EMULATION

To use VT100 emulation, select "Create a VT100 window" from the Screen Options menu.

In VT100 terminal emulation, your keyboard interacts with the system as if you were at a VT100 terminal, with the following major differences:

- Unlike the VT100, VT100 terminal emulation supports the 8-bit character and control codes in the DIGITAL Multinational Character Set.
- You can use some of the function keys at the top of the LK201 keyboard for certain line-editing functions if line-editing is enabled for DCL (DIGITAL Command Language). See Table 5-1.

Table 5-1: LK201 Control Keys Used for VT100 Terminal Emulation

Key	Function
F6	Functions as Cancel.
F10	Functions as Exit.
F12	Functions as Beginning of Line.
F13	Functions as Delete Word.
F14	Functions as Insert/Overstrike.

F7, F8, F9, and F11 are reserved for future use.

Refer to the section on using the VT100 terminal in the *MicroVMS User's Manual* for more information. Appendix ESC in the User's Manual describes the VT100 escape sequences.

For more information on the VT100, consult the *VT100 User Guide*, Order No. EK-VT100-UG.

TEKTRONIX 4010/4014 EMULATION

TEK 4010/4014 terminal emulation simulates the Tektronix 4010/4014 terminal with the Enhanced Graphics Module. Table 5-2 lists the emulated features.

Table 5-2: 4010/4014 Emulated Features

Feature	Emulated
Alpha mode text sizes	yes
Alternate character set	no
GIN (graphics input)	yes
Point plotting	yes
Special point plotting	no
Incremental plotting	no
Defocused mode	yes
Bypass mode	yes
Write-through	no
Margin processing	no

All alphanumeric keys and control keys on the Tektronix 4010/4014 keyboard have corresponding keys on the VAXstation (LK201) keyboard. However, other TEK 4010/4014 user controls do not have corresponding keys on the LK201 keyboard.

To erase the window, press the mouse select (leftmost) button.

In GIN mode, the mouse controls the crosshairs. To terminate GIN mode, press the **Return** key or the mouse select button.

Appendix B contains additional information about TEK 4010/4014 emulation. For further information, consult Tektronix 4010/4014 documentation.

WORKSTATION SETUP MENU

When you first use your workstation, certain keyboard and terminal features are set to initial default settings. Using the mouse, you can change one or more of these settings either for the current session only or for the current and future sessions.

To change setup settings, select "Setup the Workstation" from the Screen Options menu. A Workstation Setup menu will appear. When you select an option from this menu, a subwindow appears.

There are two kinds of subwindows. One shows a range of values with an arrow indicating the current one; the other shows choices with a check next to the current one.

If you just want to look at a current setting, press the select button after noting the setting.

To change a setting, move the pointer over to the subwindow and select a new setting.

The setup options are as follows:

Bell volume — Selecting this option displays a range of volumes from which to choose, from softer to louder. The bell is the beep made by the keyboard, for example, when some errors occur or messages arrive.

Keyboard autorepeat — Selecting this option displays a menu from which you can either enable or disable autorepeat. If enabled, a key that is held down repeats. For example, `jjjj`. If disabled, the key does not repeat.

Keyclick volume — Selecting this option displays a range of volumes from which to choose, from softest (off) to loudest. A keyclick is the sound made when a keyboard key is pressed.

Print destination — Selecting this option displays the current default output device. You can change this default. The initial default is `CSA0:`, which is a printer attached to the rear of the system unit (console port).

You can change the destination to any other local or remote device that supports the sixels format (for example, `LA100`, `LA50`, `LA34`, `VT125`) by selecting “Other device” and defining the system logical name, `UIS$PRINT_DESTINATION`.

There are two formats for entering a new device name:

1. The logical device name in the form `[nodename::]DDnn:`
- 2.. The name of a print queue that has already been set up using the Secure User Environment Option.

For more information on device and queue name formats, see the *MicroVMS User's Manual*.

Print status — Selecting this option displays the current state of your print queue. This option requires that a print queue has already been set up as described in the *MicroVMS User's Manual*.

Screen saver period — Selecting this option displays a range of periods from 0 to 60 minutes. The screen saver period is the amount of time of nonuse before your screen display will go off. If you set the screen saver period to 0, the screen display will not go off unless the power to the monitor or system unit is switched off.

Text scrolling rate — Selecting this option displays a menu of three text scrolling rates — fast, medium, and slow. Text scrolling is the movement of lines of text up or down the screen display.

TEK 4010/4014 terminal attributes — Selecting this option displays a menu of TEK 4010/4014 emulation attributes:

- Ignore DELETE character in graphics mode.
- Send the RETURN character on GIN termination.
- Send the RETURN and EOT characters on GIN termination.

Selecting an attribute displays a menu of two choices: enable or disable. See your TEK 4010/4014 documentation for more information about these attributes.

VT100 attributes — Selecting this option displays a menu of the VT100 emulation attributes in the following list. A check mark before an attribute means it is enabled. Move the pointer to highlight the item you want to change (in other words, to enable a disabled attribute or to disable an enabled attribute), and click the select button.

When you exit the Workstation Setup menu, any new VT100 windows you create will have the new attributes.

- Enable application keypad, not numeric keypad. The application or numeric keypad is the light gray set of keys at the right of the keyboard. When set to application, the keys can be used for application-specific purposes. When set to numeric, the keys can be used to type numbers. An application can override your Setup menu setting.
- Enable warning bell. (See description of bell under **Bell volume**.)
- Enable underline cursor, not block cursor. The cursor marks the area on the VT100 window where the next typed character will appear, if appropriate. The cursor can be set to be either an underscore or a rectangle.

Window background color — Selecting this option displays a menu from which you can choose either white or black as the background color for the VT100 window.

Window memory size — Selecting this option displays the number of bytes allocated to store window data. You can change this value to support more or fewer windows. The initial default value of 0.5 megabytes supports about 15 concurrent windows. (The number of windows varies according to their size.)

To increase window memory size, increase the value by 0.25 megabytes for each 5 additional VT100-size windows. You must also select the **Save** option after you change the window memory size.

NOTE

You must also increase the value of the SYSGEN PAGEDYN parameter the same amount. To do this,

1. Create a VT100 window and log into the SYSTEM account or a privileged user account.
2. Enter the following commands:

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> USE CURRENT
SYSGEN> SHOW PAGEDYN
```

A display appears.

3. Write down the value shown under the heading Current.
4. For every 0.25 megabytes you added to window memory size, add 250,000 to the current value of PAGEDYN.
5. Enter the result with a SET PAGEDYN command. For example:

```
SYSGEN> SET PAGEDYN 440000
```

6. Enter a WRITE CURRENT command.

```
SYSGEN> WRITE CURRENT
```

7. Enter an EXIT command.

```
SYSGEN> EXIT
```

The new values for window memory size and PAGEDYN will become current when the system is next rebooted. To insure that the values will be maintained over different versions of MicroVMS, you must also go through the following procedure:

1. Type the following command:

```
$ EDIT SYS$SYSTEM:MODPARAMS.DAT
```

2. Move the cursor to the bottom of the file.
3. Add the line:

```
PAGEDYN = n
```

where n is the value you set using SYSGEN.

4. Exit the editor.
-

Restore the last saved settings — Select this option if you change your mind about settings you made, but did not yet save the settings. Selecting this option resets settings to their state at power up or when "Save the current settings" was last selected.

Save the current settings — Selecting this option stores the changes you made on the fixed disk so that they will remain for the next power up or reboot (restart).

Exit — Selecting this option erases the Workstation Setup menu.

WHERE TO GO FROM HERE

If you are the only user or if you are the system manager for your VAXstation I, after you read this chapter, read the sections of Chapters 1 and 2 of the *MicroVMS User's Manual* that discuss setting up accounts, startup and login procedures, backups and disk management. If you have the DECnet option, you will also need to read the section on DECnet.

For information on the general use of MicroVMS, go to Chapter 4 of the *MicroVMS User's Manual*.

6

Installing Options

There are several hardware options for the VAXstation I. This chapter describes those currently available. They are:

LA100 and LA50, printers

VR10X, the tilt-swivel base assembly for the monitor

BA23A-AR, the rack-mount kit for the system unit

MSV11-QA, a memory module

RD52-D, a 31M-byte free-standing disk drive subsystem

DEQNA, an Ethernet controller module

DZV11, a multiplexer interface module that provides up to four asynchronous serial lines

This chapter describes each of those options, and goes over installation procedures where applicable. You may install the LA100 and LA50 printers, the tilt-swivel base assembly, and the rack-mount. For a MSV11-QA memory module, the RD52-D free-standing disk drive subsystem, the DEQNA Ethernet controller module, and the DZV11 multiplexer interface module, you must call your service representative to do the installation for you unless you ordered them with your initial order, in which case they are pre-installed.

To order an option, contact your sales representative.

Instructions for diagnostic tests of the options described here appear in Chapter 8.

For more information on an option discussed here, refer to documents listed at the end of each appropriate section.

THE LA100 AND LA50 PRINTERS

Two printers are available for use with the VAXstation I: the LA100 and the LA50.

Both printers are desktop units that employ dot matrix technology. You can display bit-mapped or character cell graphics on either. You have a choice of 10 national character sets to use on the LA100 and the LA50. The BC22D-10 cable is required to connect either printer to the VAXstation I. You must order this cable in addition to the printer.

Table 6-1: Printer Characteristics

Feature	LA100	LA50
Draft Print Speed (char/sec)	240	100
Memo Print Speed (char/sec)	80	50
Letter-quality Print Speed (char/sec)	30	—
Paper		
Office Stationery	Yes	Yes
Fanfold	Yes	Yes
Roll	Yes	—
Number of Selectable Character Widths	8	6
Number of Fonts Available	8	1
Maximum Paper Width	15	8.5
Weight	10 Kg	8.5 Kg

Installing the LA100

To install your LA100 printer, follow the instructions in this section. If you have an LA50 printer, go to the next section. Figure 6-1 shows the different parts of the LA100. Refer to it during installation.

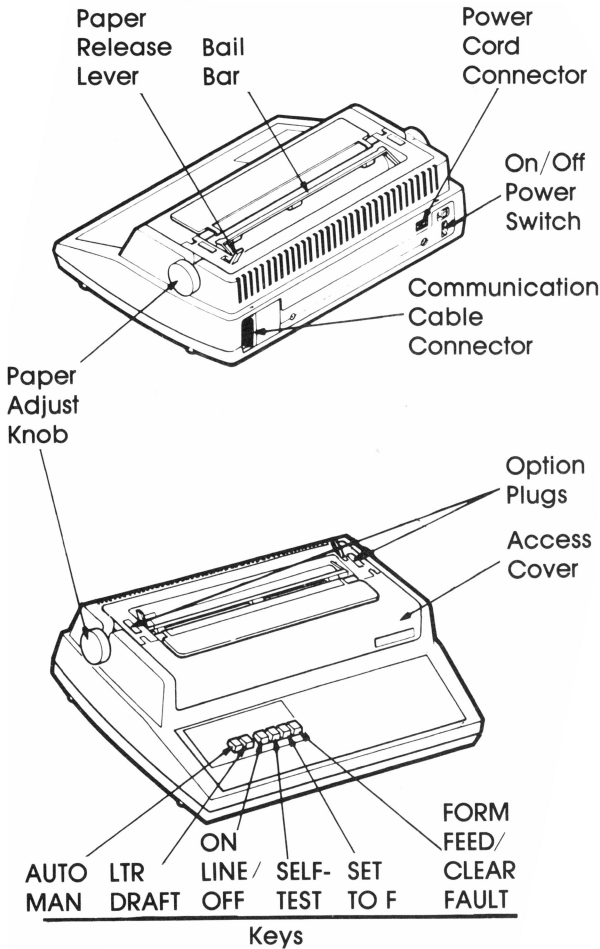


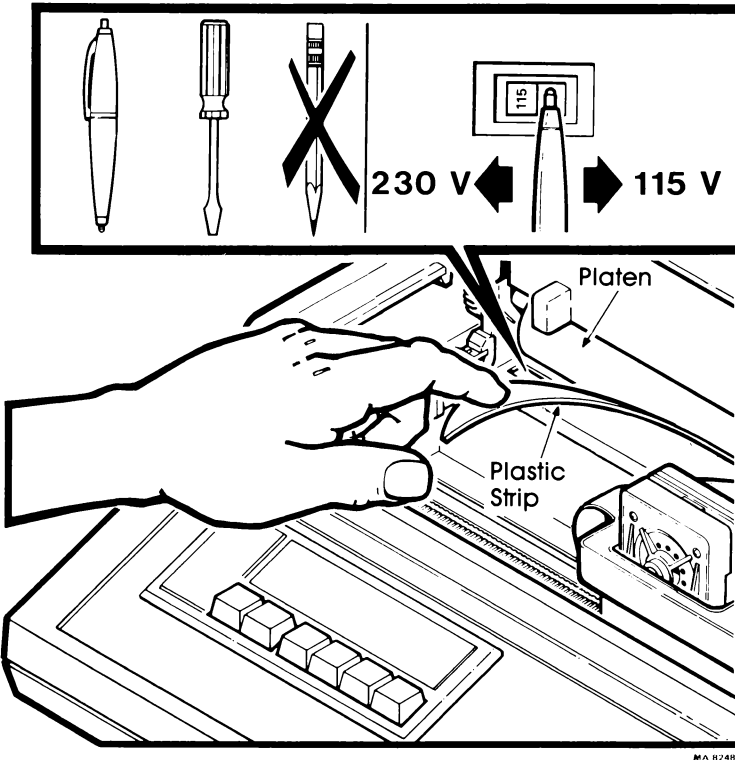
Figure 6-1: LA100 Printer

1. Lift the access cover.
2. Remove the cardboard packing insert that holds the cartridge in place.

NOTE

Save the cardboard packing insert. You may have to repack the printer and move to another location.

3. Press the On/Off switch to the Off position.
4. Read and remove the caution label over the power cord connector.
5. Plug the appropriate end of the power cable into the rear of the printer, and the other end of the cable into an electrical outlet.
6. Plug the ac power cord into a wall outlet.
7. Make sure the voltage selector switch matches the input voltage you require (115V for U.S. operation). The switch is behind the plastic strip.

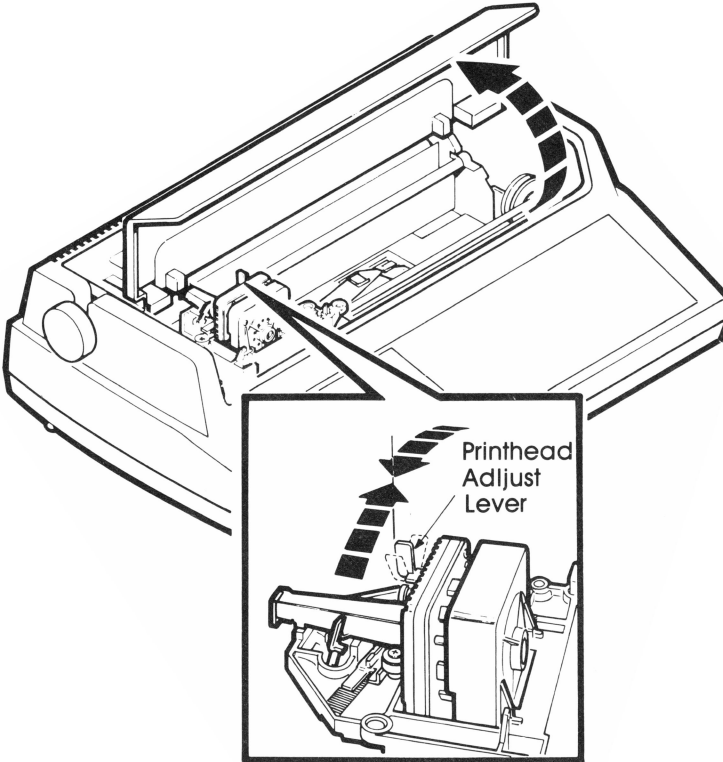


CAUTION

Always use a small slotted screwdriver or ballpoint pen to change voltage range. Never use a pencil. Lead particles can disturb terminal operation.

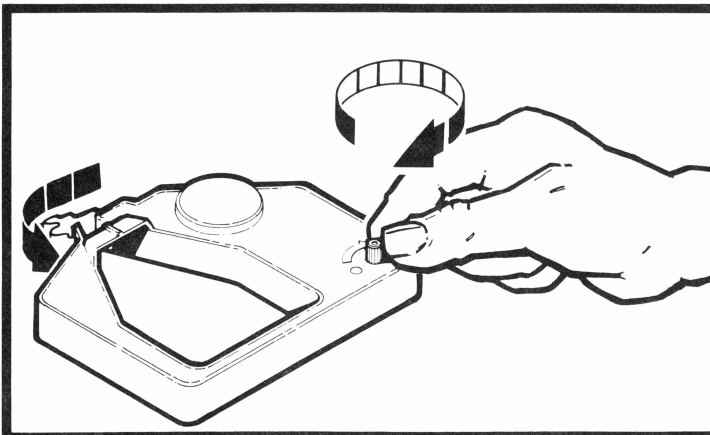
Installing the LA100 Ribbon

1. Move the printhead adjustment lever to about middle of its range.



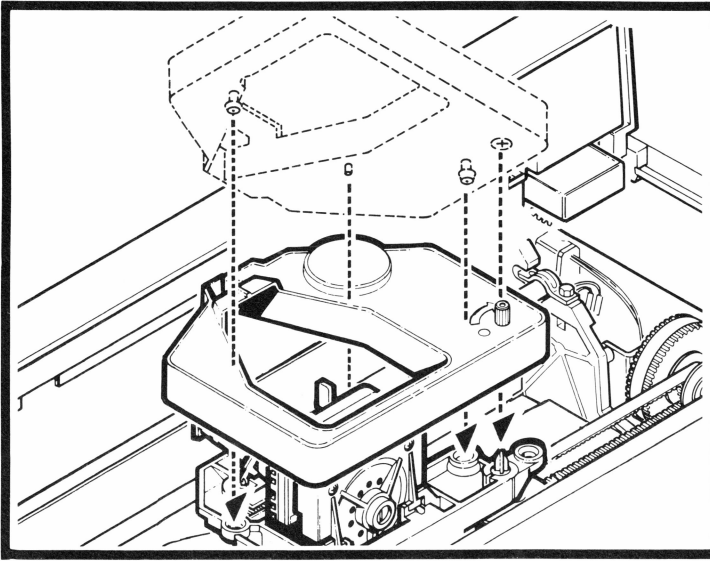
MA 8251/2C

2. Remove any slack in the ribbon by turning the ribbon adjust knob clockwise two or three times.



MA 8253

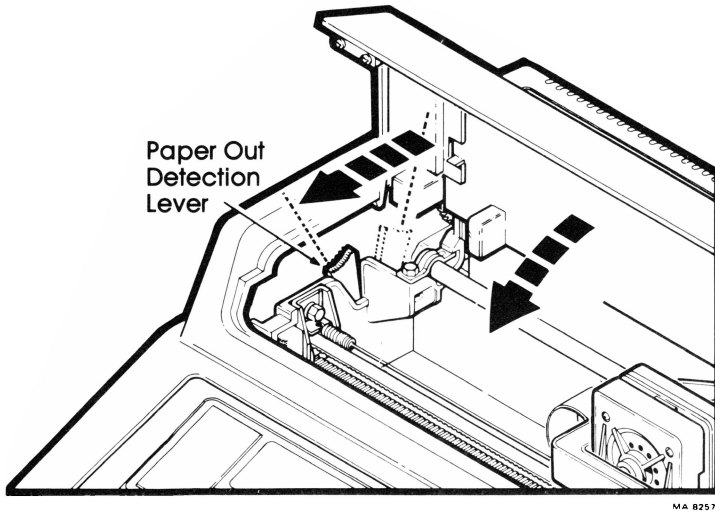
3. Line up the snap buttons on the new ribbon cartridge with the mounting holes in the carriage assembly.



MA 8254

4. Slowly press the new ribbon cartridge onto the carriage assembly while you turn the ribbon adjust knob.
5. Watch the ribbon adjust knob while you move carriage to the right and left, two or three times. The ribbon adjust knob should turn clockwise when the carriage moves. That means the ribbon is advancing correctly. If it does not turn, remove the ribbon cartridge and repeat procedure again from step 1.

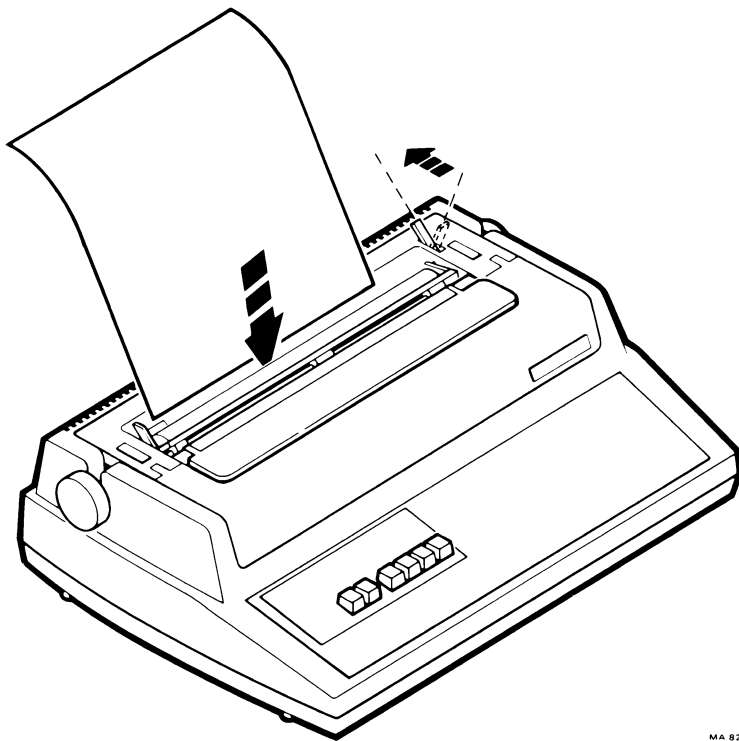
6. Make sure that the paper lever is pushed toward the front of the printer.



7. Close the access cover.

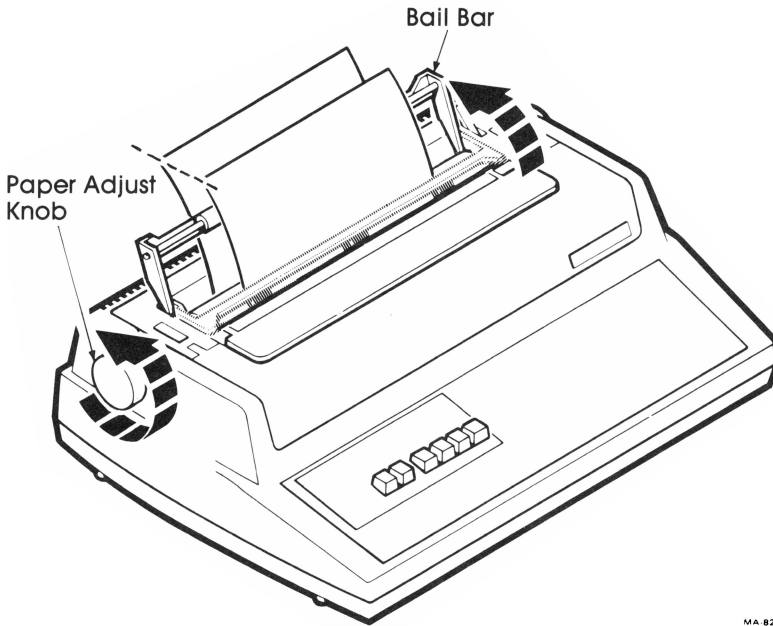
Testing the LA100

1. Make sure that the paper release lever is pushed toward the back of the printer. To move lever forward or back, first press the lever toward the left side of the printer.
2. Feed a single sheet of paper into the printer. Do not use your tractor-feed paper at this time.



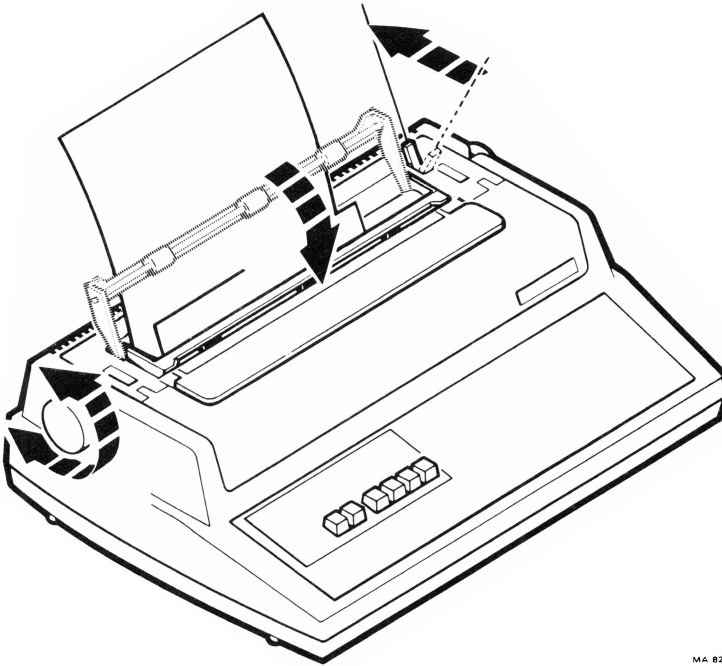
MA 8259B

3. Lift the bail bar.
4. Use the paper adjust knob to advance paper until the top edge of the paper is even with the bottom edge of the paper.



MA 8292C

5. Pull the paper release lever toward the front of the printer.
6. Position paper to the left of the printer. Smooth the paper over the platen surface and line up the sides of the paper.
7. Push the paper release lever toward the back of the printer.
8. Use the paper adjust knobs to move the paper to desired position.
9. Lower the bail bar to its original position.



MA 8261C

10. Make sure that the **ON LINE/OFF** and **SELF TEST** keys on the front panel are not locked in the down position. If they are, press to release.

NOTE _____

During the next step the **POWER/FAULT** indicator should light, and the printhead should move to the left margin.

11. Turn the power On/Off switch to On.
12. Open the access cover.
13. Move the printhead adjustment lever all the way to the left.

NOTE _____

Later, you may have to move the printhead adjustment lever to the right, if you use multi-part forms.

14. Manually move the printhead right and left, to check for smudging.
15. If the ribbon smudges the paper, first make sure the paper is installed correctly. If the paper is installed correctly, move the printhead adjustment lever to the right until the smudging stops.
16. Close the access cover.
17. Press the **FORM FEED/CLEAR FAULT** key.

NOTE

For your safety, the LA100 is designed not to operate when the access cover is open. Each time you close the cover the **POWER/FAULT** indicator flashes. Press the **FORM FEED/CLEAR FAULT** key to continue operation.

18. Press and lock the **ON LINE/OFF** key in the OFF (down) position.
19. Press and lock the **SELF TEST** key in the down position to print a status message.
20. Check the printed characters for print quality. Press the **SELF TEST** key again to exit self test.
21. If necessary, repeat the steps in this section until the printed characters are clear and sharp. You may need to use more than one sheet of paper.

LA100 Tractor Option and Tractor-Feed Paper Installation

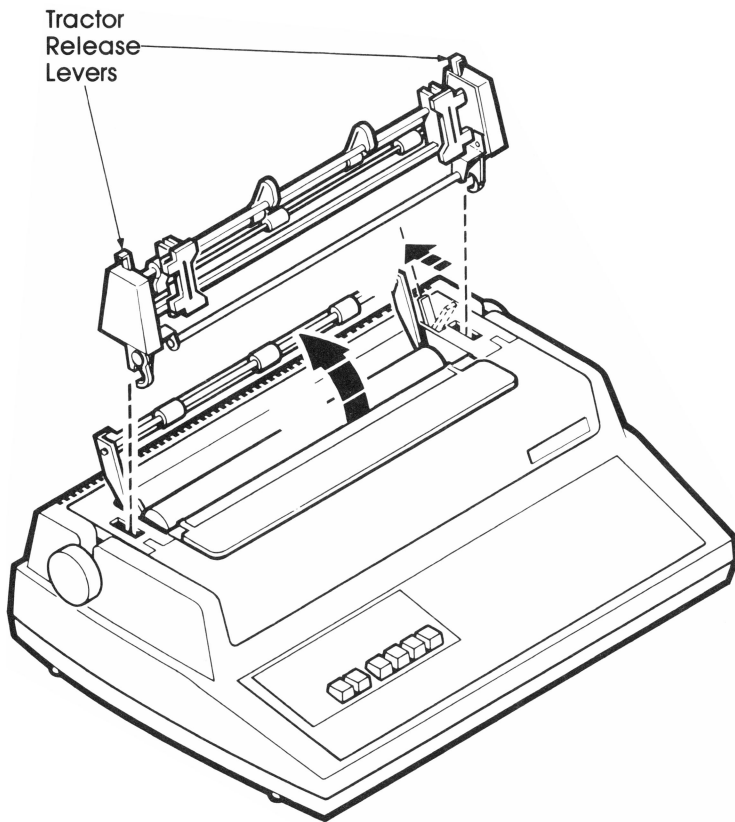
1. Lift the access cover, and remove it by pressing the retainer clips at either end.
2. Remove the option plugs from the access cover.

NOTE

Save option plugs. You may want to reinstall them later.

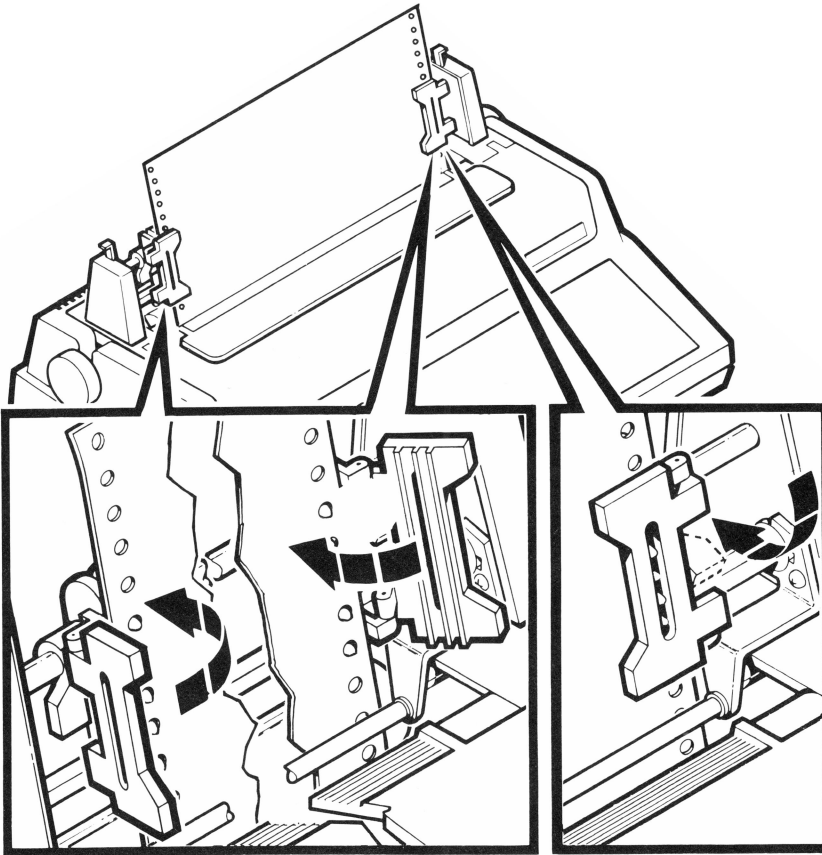
3. Press the access cover into its original position.
4. Push the paper release lever toward the back of printer.
5. Lift the bail bar.

6. Press the tractor release levers and install the tractors. Release the levers when the tractors click into place.



MA-8267C

7. Open both tractor covers.
8. Make sure the paper stack is centered directly under the tractors.
9. Feed the paper through the bottom paper slot. Make sure the paper passes between the paper tensioner and the platen to avoid poor print quality.
10. Position the paper on the tractor. If the paper does not fit properly, use the tractor release levers to reposition the tractors.
11. Place the margin holes over the tractor feed-pins, then close the tractor covers.



M.A. 8273B

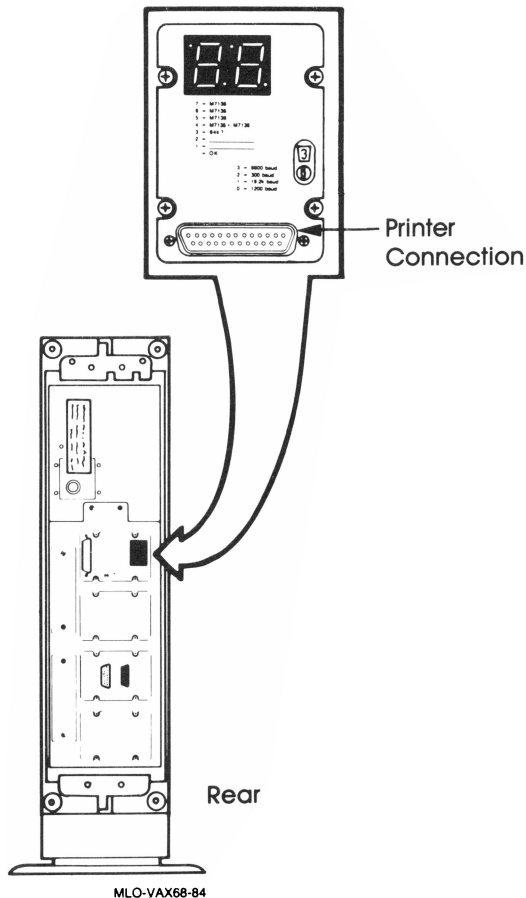
CAUTION

Do not stretch the paper too tightly. If the paper pulls against the tractor pins, or is loose in the middle, readjust the right tractor.

12. Pull the paper release lever toward the front of the printer.

LA100 Connection to the VAXstation I

1. Make sure that the power switches for both the LA100 printer and the VAXstation I are in the off position.
2. Attach either end of the communication cable to back of the printer. Both ends of the communication cable included with your system unit are the same.
3. Remove the cover from the back of the system unit by carefully pulling at the edges.
4. Attach the free end of the communication cable to the console port of your VAXstation I.



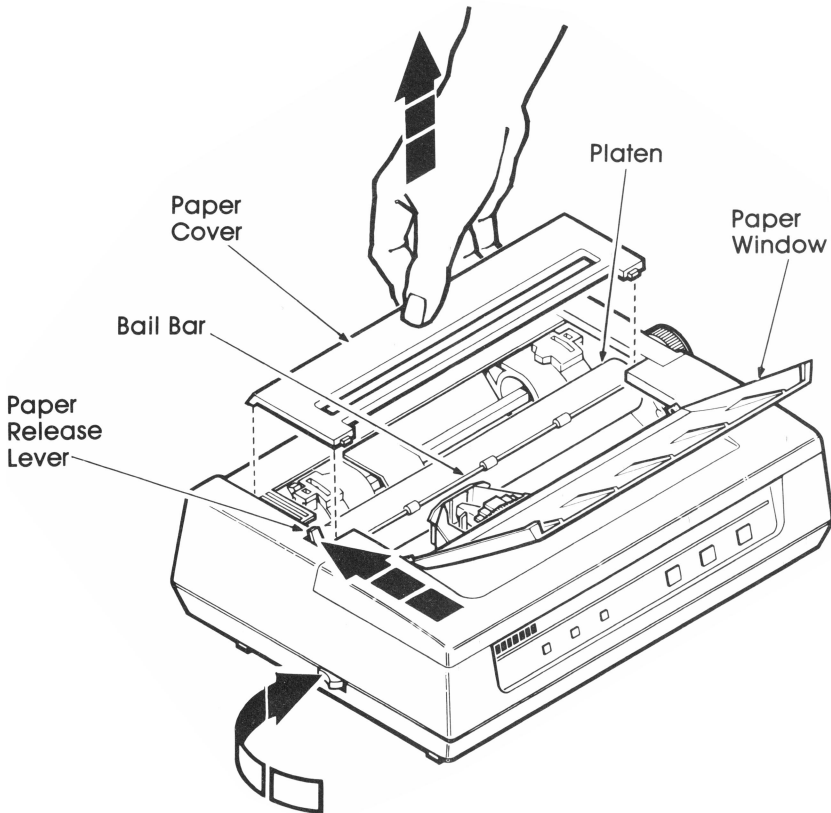
5. Replace the back cover of the system unit.

For more information about the LA100 printer, see the following documents:

- *Letterprinter 100 Operator Guide*, EK-LP100-OP
- *Letterprinter 100 Installation Guide*, EK-LP100-IN
- *Letterprinter 100 Programmer Reference Manual*, EK-LP100-RM

Installing the LA50

To install your LA50 printer, follow the instructions in this section. Figure 6-2 shows the different parts of the LA50. Refer to it during installation.



MA 10.007

Figure 6-2: LA50 Printer

1. Remove the access cover.
2. Remove the cardboard packing insert that holds the cartridge in place.

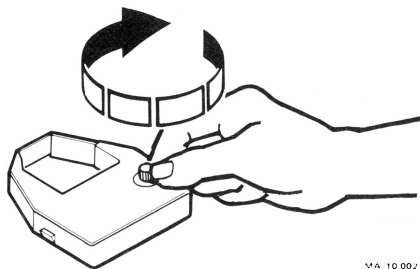
NOTE

Save the cardboard packing insert. You may have to repack the printer to move it to another location.

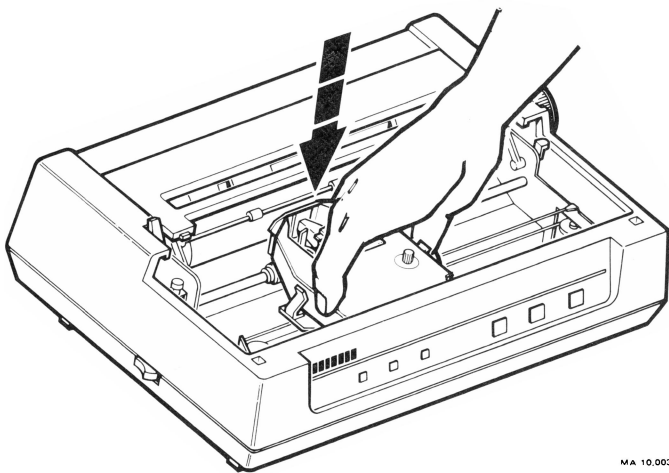
3. Make sure the power switch is set to the off position (0).
4. Plug the appropriate end of the power cable into the rear of the printer, and the other end of the cable into an electrical outlet.

LA50 Ribbon Installation

1. Take up the slack in the ribbon by turning the knob clockwise.



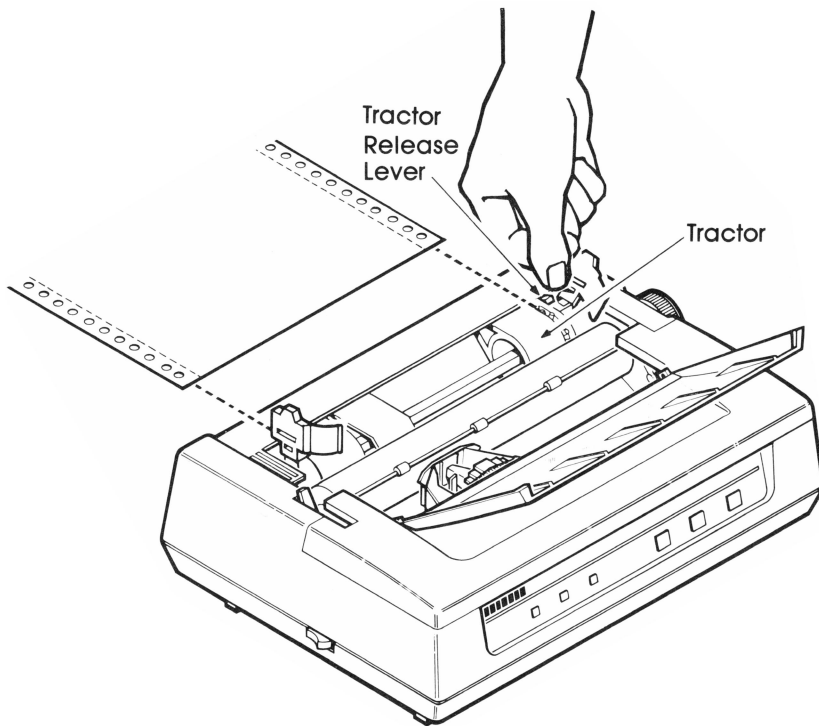
2. Position the cartridge between the clips and push down into place.



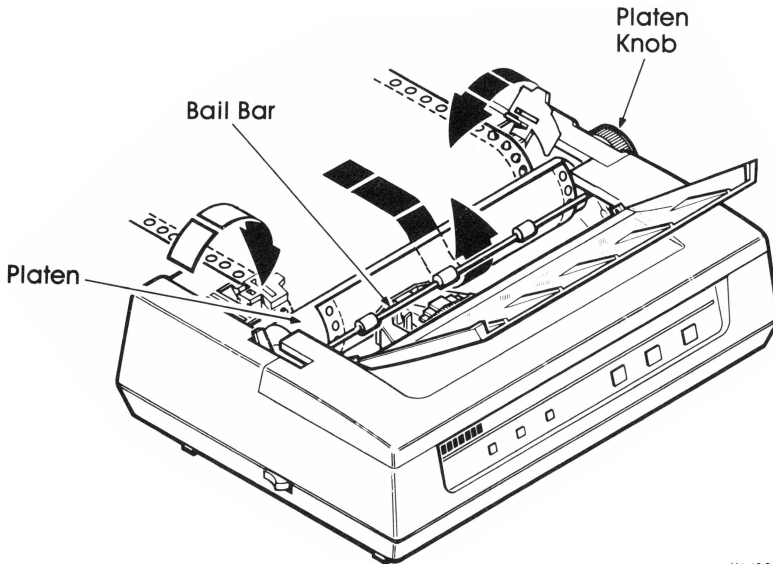
3. Replace the access cover.

LA50 Pinfeed Paper Insertion

1. Open the paper window.
2. Remove the paper cover.
3. Pull the bail bar away from the platen.
4. Push the paper release lever toward back of the printer.
5. Open the paper clamps.
6. Position the paper on the tractor. If the paper does not fit properly, use the white tractor release levers to reposition tractors.



7. Close the paper clamps.
8. Turn the platen knob and guide the paper behind the platen.
9. Advance the paper until the top is behind the bail bar.

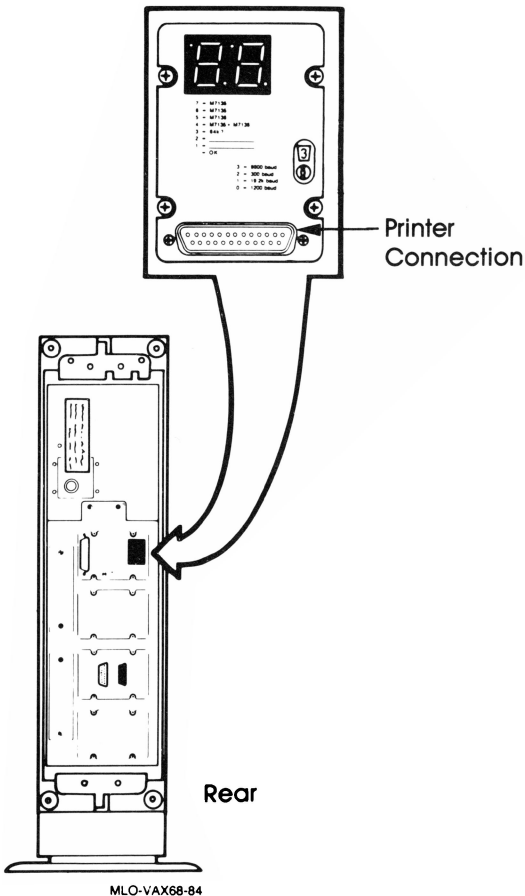


MA 10,010

10. Push the bail bar against the platen.
11. Close the paper window.
12. Replace the paper cover.

LA50 Connection to the VAXstation I

1. Make sure that the power switches for both the LA50 printer and the VAXstation I are in the off position.
2. Attach either end of the communication cable to back of the printer. Both ends of the communication cable included with your system unit are the same.
3. Remove the cover from the back of the system unit by carefully pulling at the edges.
4. Attach the free end of the communication cable to the console port of your VAXstation I.



5. Replace the back cover of the system unit.

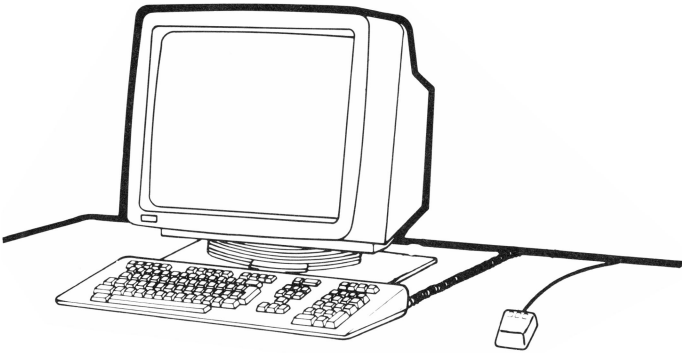
For more information about the LA50 printer, see the following documents:

- *Installing and Using the LA50 Printer* (Order No. EK-LA50-UG)
- *LA50 Printer Programmer Reference Manual* (Order No. EK-0LA50-RM-001)

THE TILT-SWIVEL BASE ASSEMBLY

This section describes how to mount the monitor on a tilt-swivel base. You may add a tilt-swivel base to your configuration at any time. The 15 inch x 15 inch base allows you to turn the monitor a full 360 degrees. A pedal at the front of the base allows you to slightly tilt the monitor up or down.

Figure 6-3 shows an installed tilt-swivel base.

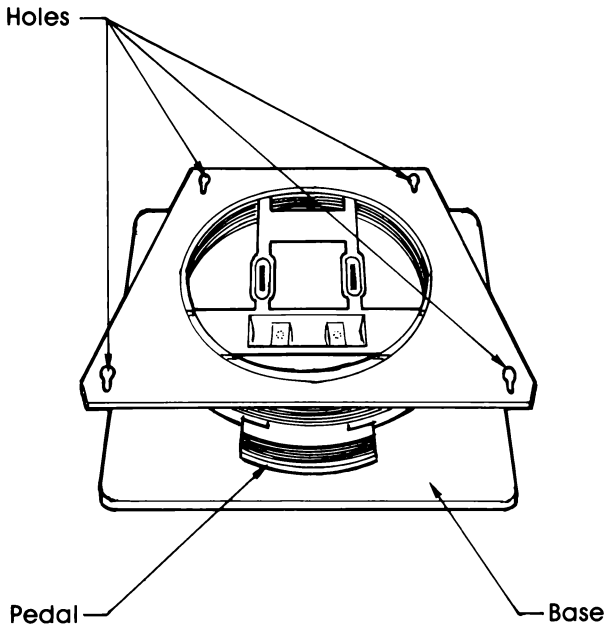


MLO-VAX74-84

Figure 6-3: Installed Tilt-Swivel Base

To install your monitor on a tilt-swivel base:

1. Shut down your VAXstation I.
2. Disconnect the keyboard from the monitor.
3. Position the base next to the monitor with the pedal facing forward.
4. Lift the monitor, and position it over the base.
5. Lower the four monitor legs into the corresponding holes on the base.
6. Push the monitor forward, so it slides and locks into place.
7. Reconnect the keyboard to the monitor.



MLO-VAX75-84

Figure 6-4: Tilt-Swivel Base Parts

THE RACK-MOUNT

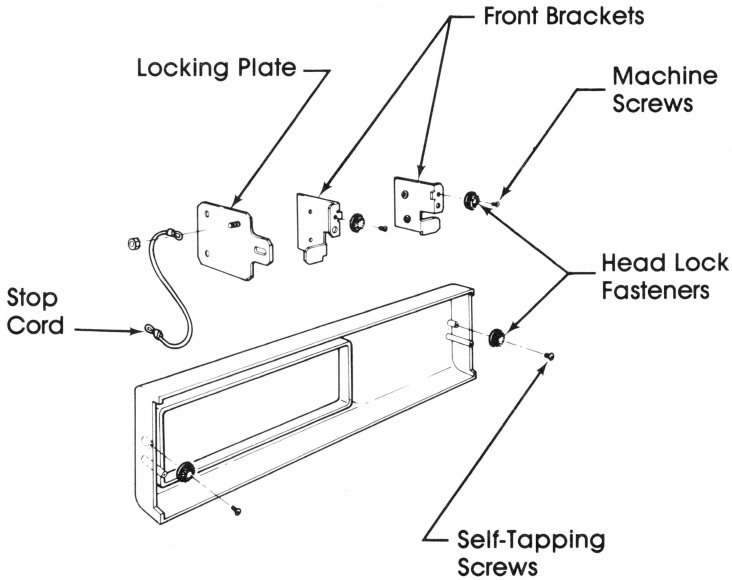
This section describes how to install a system unit into a standard 19-inch (48.2 cm) wide rack cabinet.

CAUTION

You need two people to carry out these procedures.

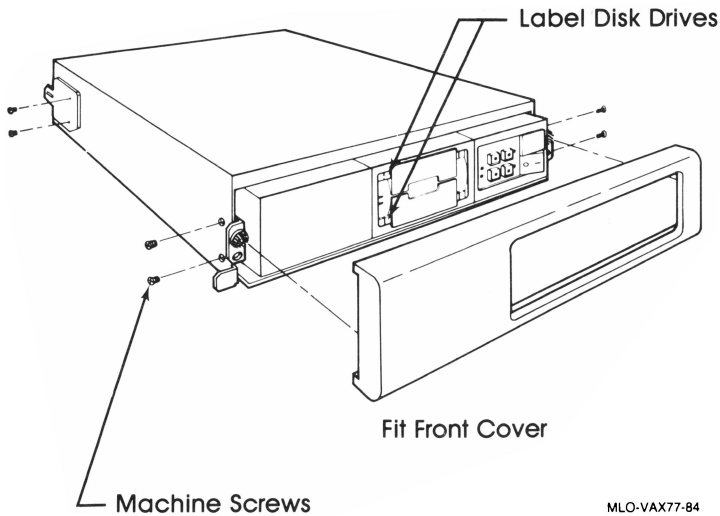
You have unpacked the system unit using the unpacking instructions in Chapter 1. You should now have a system unit and three cartons, which contain the front cover, accessories and documentation, and the rail hardware.

1. Locate and open the carton that contains the rails, the locking plate, the two front brackets, the head lock fasteners, the stop cord, and the screws. Locate and open the carton that contains the front cover.
2. Install the head lock fasteners on the front brackets and on the inside of the front cover.
3. Install the stop cord on the locking plate.



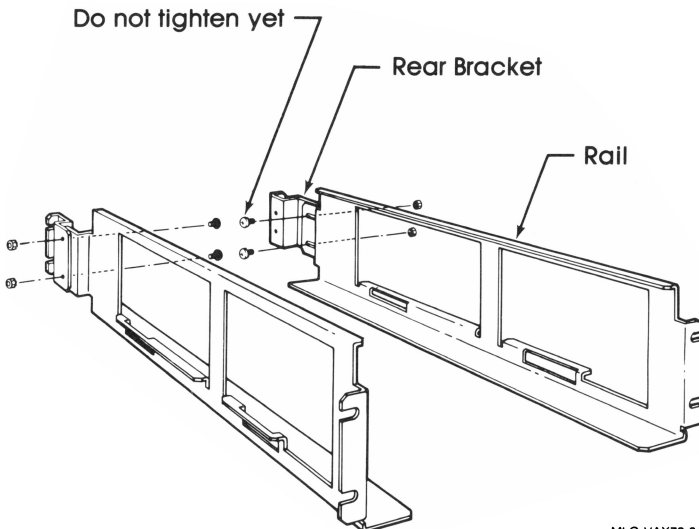
MLO-VAX76-84

4. Install the front brackets on the front of the system unit as shown.
5. Install the locking plate on the rear of the system unit as shown.
6. Locate the sheet of labels in the installation accessories. Label the disk drives and fit the front cover.



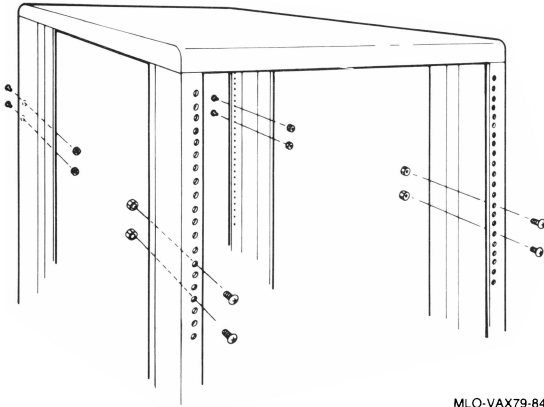
MLO-VAX77-84

7. Locate the left and right rails and the rear brackets. Fit the rear brackets to the rails as shown. Do not tighten the brackets yet.



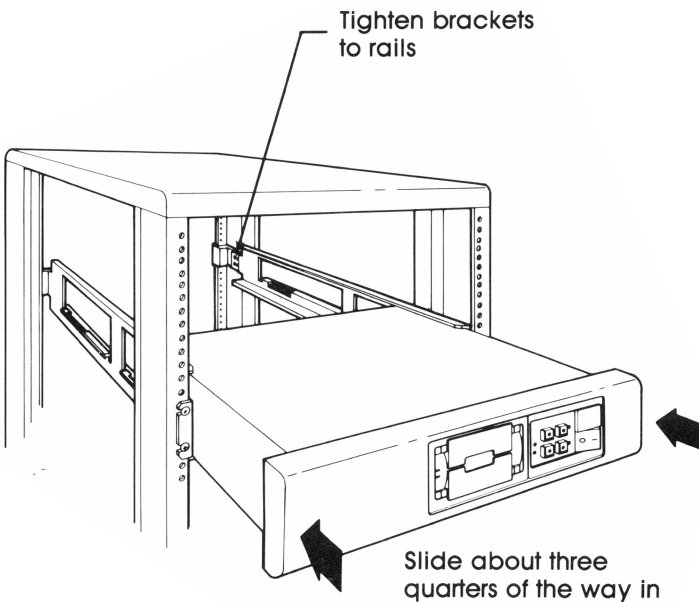
MLO-VAX78-84

8. Fit the nuts and bolts that will secure the rails to the cabinet posts. Do not tighten the nuts yet. If captive nuts are supplied, you need only fit these.



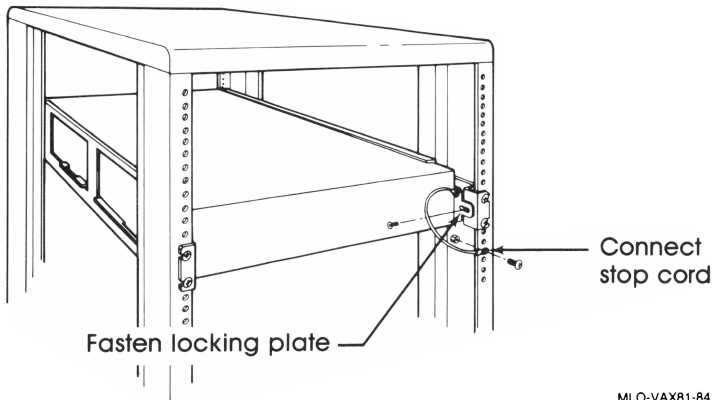
MLO-VAX79-84

9. Install the rails to the cabinet. Tighten the bolts that hold the rails to the cabinet posts.
10. Slide the system unit into the rack about three quarters of its length.
11. Tighten the rear brackets to the rails.



MLO-VAX80-84

12. With the system unit fully inserted in the rack, fasten the locking plate located at the left rear of the system unit.
13. Connect the free end of the stop cord to the rack post.



MLO-VAX81-84

Return to Chapter 2 to install the monitor, keyboard, and mouse, and conduct preliminary testing of the system.

THE MSV11-QA MEMORY MODULES

The MSV11-QA memory modules are random access memories that use MOS (metal oxide semiconductor) chips. The modules are designed for use with the Q22 bus and support block mode direct memory access (DMA) transfers. Each module provides storage for 16-bit words and contains parity control circuitry. Each module also contains a control and status register (CSR). The MSV11-QA module provides 1024K-bytes of memory.

Each module is a single, quad-height module that contains Q22 bus interface, timing and control logic, refresh circuitry, and a MOS storage array. These modules require +5 Volts, which is provided by the VAXstation I system backplane.

The maximum memory that can be installed is four MSV11-QAs for a total of 4M-bytes.

To add a MSV11-QA memory module to your VAXstation I after the initial system installation, contact your sales representative. If you experience any problems with the MSV11-QA memory module call your service representative.

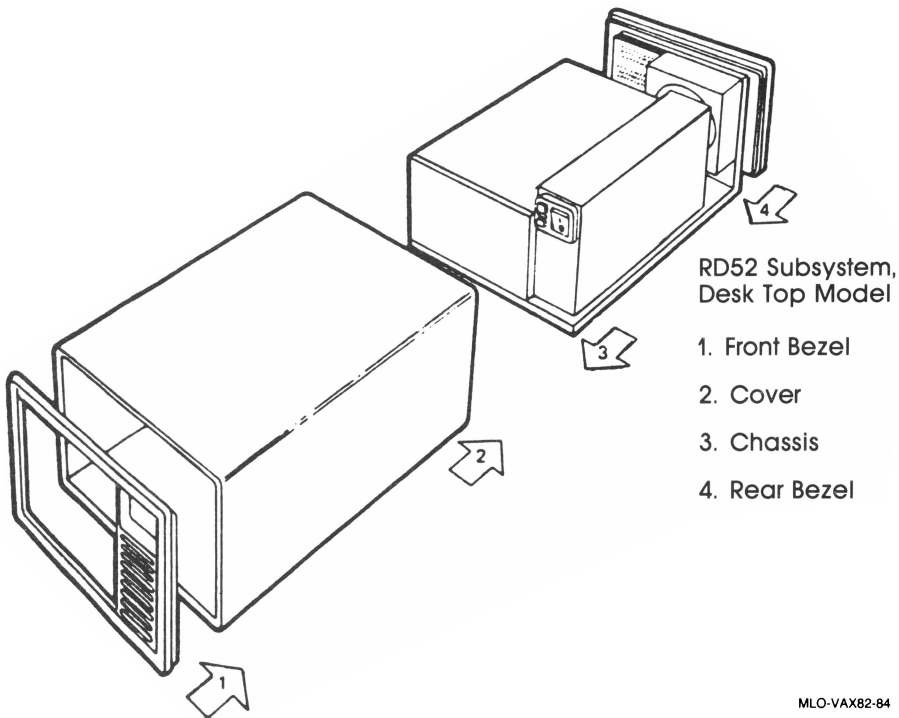
For additional information about the MSV11 memory modules, see *Micro-VAX Handbook* (Order No. EB-25156-47)

THE RD52-D FREE-STANDING DISK SUBSYSTEM

The RD52-D is a free-standing disk subsystem similar to the fixed disk inside the VAXstation I system unit. The total formatted capacity of the RD52-D is 28M-bytes. It provides external add-on storage for the VAXstation I.

Each RD52-D subsystem has a mounting chassis that holds the fixed disk drive assembly, a power supply assembly, a dc cooling fan assembly, a printed circuit board for external cable signal distribution, a front panel assembly, and a rear panel assembly.

The RD52-D may be mounted in a desktop configuration for use at 120 Vac and 240 Vac. The basic chassis of the desktop unit comes with a cover with front and rear bezels. Figure 6-3 shows the unit.



MLO-VAX82-84

Figure 6-5: RD52-D Free-Standing Disk Subsystem

To add an RD52-D disk subsystem to your VAXstation I after the initial system installation, contact your sales representative. If you experience any problems with your RD52-D, call your service representative.

THE DEQNA

The DEQNA is a Q22 bus-compatible communications module that interfaces between an Ethernet local area network (LAN) and a VAXstation I or MicroVAX I system. With a DEQNA interface, the VAXstation I system becomes a node on a DECnet network, and can communicate with other computers that are also nodes on the network.

The DEQNA option also enables a VAXstation I to be down-line loaded with a system image from a host computer on the network.

The DEQNA module is installed on the VAXstation I backplane, and connected to the panel on the rear of the system unit. There are two ways to connect the VAXstation I to an Ethernet network:

1. Connect the VAXstation I to a DELNI (low cost interconnect) using a BNE3X transceiver cable.
2. Connect the VAXstation I to an H4000 transceiver.

If you received your VAXstation I with the DEQNA module already installed, you can connect the BNE3X transceiver cable to a DELNI. To connect an H4000 transceiver, however, you must contact your network manager or service representative.

The BNE3X series of transceiver cables comes in four types:

BNE3A – PVC, straight connector

BNE3B – PVC, right angle connector

BNE3C – Teflon, straight connector

BNE3D – Teflon, right angle connector

Each of the above transceiver cables comes in three lengths: 5, 10, or 20 meters (BNE3X-05, BNE3X-10, BNE3X-20). If the coax cable is not installed you also need to order BNEZA-XX cable. The coax cable also comes in three lengths: 23.4, 70.2, or 117 meters (BNEZA-MA, BNEZA-MB, BNEZA-MC).

To add a DEQNA to your VAXstation I after the initial system installation, contact your sales representative. You will need to order the basic DEQNA board, as well as the CK-DEQNA-KB cabinet kit.

To test the DEQNA Ethernet Controller Module, use Macroverify and the DEQNA diagnostics.

For more information on the DEQNA, see the following documents:

- *MicroVAX Handbook* (Order No. EB-25156-47)
- *DEQNA User's Guide* (Order No. EK-DEQNA-UG)

THE DZV11 MODULE

The DZV11 is an asynchronous multiplexer that connects the Q22 bus with up to four asynchronous serial data communications channels.

The DZV11 is a quad-height module that can be used in a variety of applications. It is typically used to connect hard copy and video terminals, with or without modems, to a system. With a VAXstation I, the DZV11 could also be used as an asynchronous DECnet link. The DZV11 allows dial-up (auto-answer) operations with modems capable of full-duplex operation such as DIGITAL's models DF01, DF02, and DF03.

The DZV11 provides flexible control of parameters, such as baud rate (50 to 9600), character length, number of stop bits for each line, odd or even parity for each line, and transmitter-receiver interrupts. Additional features include limited data set control, break generation and detection, and silo buffering of received data.

To add a DZV11 to your VAXstation I after the initial system installation, contact your sales representative.

The following documents contain more information about the DZV11:

- *MicroVAX Handbook* (Order No. EB-25156-47)
- *Microcomputer Interfaces Handbook* (Order No. EB20175-20)
- *DZV11 Asynchronous Multiplexer Technical Manual* (Order No. EK-DZV11-TM)

7

Troubleshooting Procedure

This chapter provides information for troubleshooting the VAXstation I. The first section lists some typical minor problems, their causes, and corrective actions.

The rest of the chapter is an overview of how hardware problems are handled and diagnosed. Using this information, and the information in Chapter 8, you can isolate a hardware problem.

CHECKING FOR SOME TYPICAL PROBLEMS

The first step to take if you have a problem is to check out the meanings of error messages displayed on the monitor and/or CPU patch panel indicator on the rear of the system unit. Table 8-1 in Chapter 8 describes the possible messages on the CPU patch panel indicator. These are all indicators of a hardware problem.

Some error messages indicate a software problem. These messages appear on the monitor; sometimes you can figure out the problem just by reading the message. Other times, you may need to refer to specific software documentation or call a support person.

Table 7-1 shows some basic problems that may not result in any message and describes some possible causes and corrective actions.

Table 7-1: Basic Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
No response when power switch is turned on.	The system is not plugged in.	Plug in the system.
	The power cable is installed incorrectly.	Verify that the cable is plugged in properly. Refer to Chapter 2.
	There is no power at the wall outlet.	Try using a different wall outlet.
	The system power supply is faulty.	Contact service representative.
Power is on, but there is no response at the console.	The console is off.	Press the monitor power switch to ON (1) position.
	The monitor cable is installed incorrectly.	Verify that both ends of the cable are installed properly. Refer to Chapter 2.
	Contrast is not set properly.	Adjust contrast control.
	Rear panel display indicates a self-test error.	Look up error number in Table 8-1 and take appropriate action.
Self-test completed, but software does not start automatically.	Halts are enabled.	Press and release Halt pushbutton. Light must be off.
Software does not start from the diskette drive.	There is no diskette in the drive.	Insert a diskette into the drive.
	The diskette drive door is not closed.	Close the drive door.
	The diskette is inserted incorrectly.	Verify that the diskette is inserted properly. Refer to Chapter 4.
	There is no loadable software on the diskette.	Use a loadable diskette such as the diagnostics diskette or the stand-alone backup diskette.
	The diskette drive has an unformatted diskette.	Use a DIGITAL formatted diskette.

(Continued on next page)

Table 7-1: Basic Troubleshooting Procedures (Cont.)

Problem	Possible Cause	Corrective Action
Software does not start from the hard disk drive.	Software error.	Refer to software documentation.
	The diskette drive is faulty.	Contact service representative.
	The drive is not ready.	Press and release the Ready pushbutton if the green light is not lit.
	There is no operating system on the disk.	Install MicroVMS. (See Chapter 3.)
	A replacement drive has an unformatted disk.	Format the new disk. (See Chapter 8.)
Diskette is read-only.	Software error.	Refer to software documentation.
	Diskette is write-protected.	Remove foil write-protect sticker from the diskette.
	Diskette is full.	Try another diskette.
Hard disk is read-only.	Hard disk is write-protected.	Press and release the Write-protect pushbutton.

FIELD REPLACEABLE UNITS

The method of fixing hardware failures is to replace removable components, known as Field Replaceable Units (FRUs). When you suspect you have a problem, first run the diagnostics to see if it is a hardware failure. When the source of the problem has been isolated and verified using the diagnostics, you should contact your Field Service or other designated service representative to replace the faulty unit. The location of each FRU is shown in Figure 7-1.

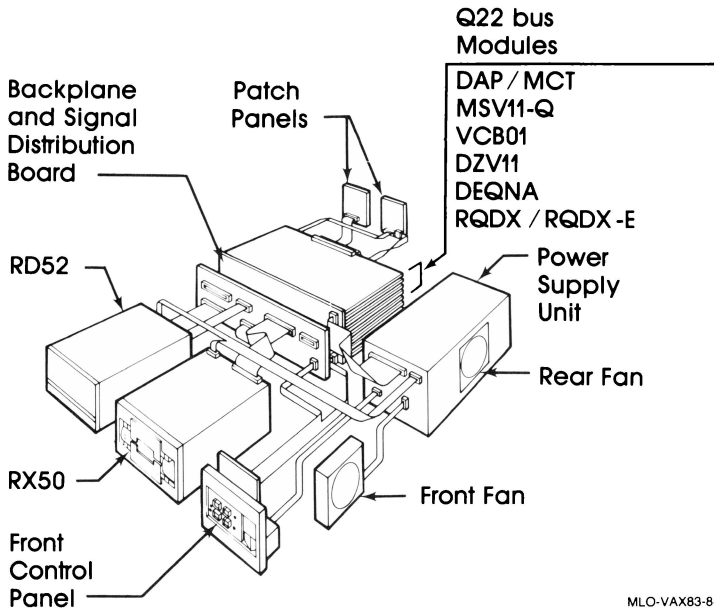


Figure 7-1: Field Replaceable Units

The *VAXstation I Pocket Service Guide* and the *VAXstation I Technical Manual* contain additional information about FRUs.

OVERVIEW OF TROUBLESHOOTING THE VAXSTATION I

The three types of diagnostics are listed in the order in which you use them.

1. Microverify and the VCB01 Power Up Self-Test
2. Stand-alone Diagnostics
3. Diagnostics that run under the VAX Diagnostic Supervisor (VDS)

Those diagnostics are described briefly in the following sections. Chapter 8 presents details on how to run them.

Microverify and the VCB01 Power Up Self-Test

The VAXstation I has an internal self-test, called Microverify, which tests system reliability and helps isolate failures. Microverify runs automatically when you turn on the power to the system unit. You can also run Microverify by issuing the TEST console command as described in Appendix A.

Microverify provides the first level of troubleshooting. If successful, Microverify verifies that the system is functional enough so that additional diagnostics can be run.

If Microverify indicates a failure, you should contact your field support personnel for help.

When you turn the system unit power on, Microverify runs and then the system starts up (boots). As the system boots, the VCB01 self-test runs automatically to check the VCB01.

Stand-Alone Diagnostics

Stand-alone diagnostics do not need any additional software to run. These diagnostics consist of Macroverify, the CPU diagnostic, and the Memory diagnostic.

MACROVERIFY — Use Macroverify to isolate a problem to a FRU. Once you load and bootstrap Macroverify, it runs by itself. When Macroverify completes, it displays a report containing a status message for each subsystem. Successful completion of Macroverify indicates your program will run on the operating system installed on your computer. If a subsystem fails Macroverify, you run a specific device diagnostic to confirm the diagnosis and further isolate the problem.

CPU DIAGNOSTIC — The CPU diagnostic performs CPU testing in addition to that done by Microverify. The results are displayed on the monitor.

MEMORY DIAGNOSTIC — The Memory diagnostic exercises memory by writing and reading patterns while checking for errors. It isolates memory failures to the failing board and displays test results.

VDS Diagnostics

The VAX Diagnostic Supervisor is software, similar to an operating system, which is optimized for running diagnostics. The diagnostics that run under VDS include:

- VCB01
- DZV11
- DEQNA
- Storage Subsystem
- DHV11

8

Diagnostics

This chapter explains how to run each diagnostic. Read Chapter 7 if you are not sure which diagnostic to use.

MICROVERIFY

Microverify, permanently resident microcode, is executed automatically when system power is turned on. You can also invoke Microverify by issuing the TEST console command described in Appendix A.

Before you run Microverify, make sure the monitor is powered on, and that the four green indicators on the back of the monitor are on. If you do not see anything on the screen when you power the system on, check to see if the contrast control is set properly. Chapter 4 describes the monitor controls.

To interpret the results of a failed Microverify test, remove the system unit rear cover so that you can watch the CPU indicator on the rear panel. This indicator is a seven-segment light emitting diode (LED). (Chapter 2 shows how to remove the cover.)

Operation

By default, Microverify runs each test once. This procedure is called Single Pass Mode. Your field support personnel can also modify the hardware so that Microverify runs in Infinite Loop Mode. For most purposes, Single Pass Mode is sufficient. In Single Pass Mode, you are informed that Microverify is running when the following message is output on your console:

```
MICROVERIFY STARTED
```

Approximately five seconds later one of the following messages is also output:

```
MICROVERIFY PASSED
```

```
MICROVERIFY FAILED
```

When Microverify begins, the indicator on the CPU rear patch panel assembly shows the number 7. As the test continues, numbers will be displayed in descending order.



Table 8–1: CPU Patch Panel Indicator Coding

Number	Meaning
7	Microverify failed before completing the data path microsequencer test.
6	Error found on DAP board.
5	Error found on MCT board.
4	Undetermined error in DAP/MCT interface. May be a problem with the cable that connects the DAP and MCT modules.
3	Microverify worked as expected, but bad memory was found. Run CPU and Memory diagnostics.
2	No boot device was found. May be a problem with the RQDX controller.
1	Unable to boot from selected device. May be a problem with the hard disk.
.	Control has passed to the secondary bootstrap.
Blinking 7	CRT controller video readback failed.
Blinking 6	CRT controller failed.
Blinking 5	Keyboard failed power up self-test.
Blinking 4	UART internal loopback test failed.
Blinking 3	Bitmap memory defective.
Blinking 2	Bitmap memory in wrong location.
Blinking 1	CSR is misconfigured.

Microverify is the first attempt at detecting and isolating a problem. If you suspect a problem after Microverify has successfully run—for example, if an application program no longer runs successfully—load and run Macroverify. If a problem still exists, run the CPU and Memory diagnostics. If those diagnostics indicate a problem with a module or drive, then run one of the VDS diagnostics.

STAND-ALONE DIAGNOSTICS

The three stand-alone diagnostics, Macroverify, CPU, and Memory, are on the diskette labeled, "MICROVAX DIAGNOSTICS 1."

Run the stand-alone diagnostics from console mode. Enter console mode by pressing the **Halt** pushbutton twice.

CAUTION

Before entering console mode, always make sure you close any open files and log out of any open accounts.

MACROVERIFY

Macroverify (EHKMV) tests the VAXstation hardware. Run Macroverify when you first install your system (Chapter 2) and, later, when diagnosing a system that is suspected of having a problem. Macroverify is normally run before other diagnostics in order to provide a quick check and rule out applications software or user errors.

Running Macroverify will not destroy your disk data.

After Macroverify runs successfully, an application can be run on the system without hardware problems. If Macroverify fails to run, you should run additional diagnostics to obtain more information about the problem.

Macroverify is contained on the diskette labeled "MICROVAX DIAGNOSTICS 1." Macroverify takes about 4 minutes to run.

How to Run Macroverify

1. Close any open files and log out of any open accounts.
2. Press the system unit power switch to the off (0) position.
3. If you have the DZV11 option, disconnect any external cables from the DZV11 patch panel (the panel next to the CPU patch panel).
4. Power up the monitor.
5. Press the system unit power switch to the on (1) position.
6. Press the **Halt** pushbutton twice to go into console mode.
7. Insert a blank diskette in drive 2.
8. Load the Macroverify diskette into diskette drive 1 and enter the following BOOT command:

```
>>> B DUA1
```

9. Macroverify will display messages telling you what to do.

For each device, a test is made to see if the device responds to its assigned Q22 bus address. * If the device does not respond, the following status message is output in the table entry corresponding to the device:

```
DEVICE xx WITH CSR yy, VECTOR zz NOT FOUND. NO
TESTING PERFORMED
```

xx, yy, and zz represent the device name, CSR, and vector numbers and will be replaced in the actual message with information that describes the device. The vector number will not be output for devices with programmable or floating vectors such as the DEQNA.

If the device does respond, a sequence of user level tests is then performed. The result of each test is reported as either:

```
TEST SUCCEEDED
```

or

```
TEST FAILED
```

The test time indicated for each test is the maximum amount of minutes and seconds the test should take. If the diagnostic does not issue a message regarding the test status in the time indicated, you should assume the device has a fault and consult your support person for help.

The tests performed on each device are typical of the types of operations that would be performed by a user application; for example, reading a block of data from a disk.

The next example illustrates a sample Macroverify run and the output. The sample shown is carried out on a test system consisting of 1 megabyte of memory, two diskette drives, one fixed disk drive, one VCB01, and one DEQNA.

* For more information about the Q22 bus, also called the LSI extended bus, see the *MicroVAX I CPU Technical Description*.

```
>>> B DUA1
```

```
ATTEMPTING BOOTSTRAP
```

```
Macroverify X1.7
```

```
This MicroVAX I is at microcode revision level 5, hardware re-  
vision level 1, and includes support for F_FLOAT and D_FLOAT  
data types.
```

Testing	Time to Test (Mins.)	Comments
Memory	0:50	TEST SUCCEEDED (1.0 Mb)
Disk unit DUA0	0:20	TEST SUCCEEDED (RD52)
Disk unit DUA1	0:20	TEST SUCCEEDED (RX50)
Disk unit DUA2	0:20	TEST SUCCEEDED (RX50)
DLVJ1	0:40	DEVICE DLVJ1 WITH CSR 776500 NOT FOUND. NO TESTING PERFORMED.
DZV11	0:40	TEST SUCCEEDED
DEQNA	0:10	TEST SUCCEEDED (Address = AA-00-03-01-11-33)
VCB01	0:10	TEST SUCCEEDED

```
Macroverify test completed.
```

```
Press RETURN key to enter console command mode.
```

Example 8-1 Sample Macroverify Run

10. When Macroverify has finished running, press the **Return** key to display the console command prompt (>>>).

Interpreting Macroverify Output

You must first verify that the amount of memory displayed on the test output is the same as the amount installed on your system (1 megabyte in this example). If the value differs, run the Memory diagnostic as the memory may be incorrectly configured or have other hardware errors. See **MEMORY DIAGNOSTIC** in this chapter.

If a device is reported as not found, determine if the device is physically present. If the device is physically present, report this problem to your support person.

Macroverify Error Messages

Macroverify reports errors associated with a particular device in the column titled **Comments**.

The error messages describe the problem and direct you further. Some of the error messages pertain to mistakes made in running the test. If you get one of those messages, rerun the test.

Other errors indicate a faulty module. If an error message instructs you to check module jumpers, change vector addresses, insert grant cards, move/replace any module, or run a test that requires opening the system unit, write down the error message and contact your support person.

The errors that you can fix are as follows:

- Please verify that the cable from the DEQNA module to the DEQNA patch panel assembly is correctly connected. Please verify that the fuse at the DEQNA patch panel assembly has not blown.

Corrective action: Replace the fuse and rerun Macroverify. If the problem is not with the fuse, contact your support person to check the DEQNA cabling.

- This unit either has no media or has been disabled. Please correct and rerun this diagnostic.

Corrective action: Make sure the console **Ready** pushbutton is in the out position and that the diskettes are properly inserted. Rerun Macroverify.

- This disk is not hardware formatted. Please format the disk, or, if this is a diskette, please use another diskette with correct hardware format and rerun this diagnostic.

Corrective action: For fixed disk: Use the Disk Subsystem diagnostic (described later in this chapter) to format the disk and rerun Macroverify. For diskette: Load the correct diskette into the drive and rerun Macroverify.

- This disk is write protected. Please enable writing on the disk and rerun this diagnostic.

NOTE

Testing will NOT destroy disk data.

Corrective action: For fixed disk: Put the fixed disk **Write Protect** and **Ready** pushbuttons on the front control panel in the out position. Rerun Macroverify. For diskette: Replace the diskette with one that is write enabled and reload. The Removable disk Write Protect indicators on the front control panel should be off. Rerun Macroverify.

CPU DIAGNOSTIC

The CPU diagnostic (EHKAA) determines if the CPU is functional. Run this diagnostic when Macroverify indicates a CPU problem.

The CPU diagnostic is on the diskette labeled "MICROVAX DIAGNOSTICS 1."

How to Run the CPU Diagnostic

1. Load the CPU diagnostic diskette into diskette drive 1 and enter the following BOOT command:

```
>>> B/100 DUA1
```

When the Bootfile: prompt appears, enter the CPU diagnostic file name as follows:

```
Bootfile: LSYSO,SYSMAINTJEHKAA,EXE
```

2. The test will begin running. After each 10 passes of the diagnostic (this takes approximately 20 seconds), a single line, containing the version number of the diagnostic, is displayed. The diagnostic continues until an error is detected or until you press the **Halt** pushbutton twice.

The following example shows a CPU diagnostic run.

```
EHKAA v1.13 CPU Test  
EHKAA v1.13 Pass number 10 done!  
EHKAA v1.13 Pass number 20 done!  
EHKAA v1.13 Pass number 30 done!  
EHKAA v1.13 Pass number 40 done!  
EHKAA v1.13 Pass number 50 done!  
EHKAA v1.13 Pass number 60 done!
```

Example 8-2: Sample CPU Diagnostic Output

CPU Diagnostic Error Messages

If the diagnostic produces an error message, **write it down** and contact your support person.

MEMORY DIAGNOSTIC

The Memory diagnostic (EHXMS) tests the memory module(s). This diagnostic identifies a memory board that failed. Run the Memory diagnostic when the operating system detects memory errors or when intermittent program failures suggest that a problem exists in the memory subsystem.

Before you run the Memory diagnostic, run the CPU diagnostic to verify that the CPU is functioning correctly.

The Memory diagnostic is distributed on the diskette labeled "MICROVAX DIAGNOSTICS 1." The diagnostic takes up to 12 minutes per 256 kilobytes of memory for full testing (default) and 7 minutes per 256 kilobytes with no memory parity testing.

How to Run the Memory Diagnostic

1. Load the Memory diagnostic diskette into diskette drive 1 and enter the following BOOT command:

```
>>> B/100 DUA1
```

When prompted for the boot file, enter the Memory diagnostic file name as follows:

```
Bootfile: LSYSO,SYSMAINTJEHXMS,EXE
```

A header message appears, containing the Memory diagnostic version number.

2. If you want the diagnostic to display status after each test, enter ENABLE TRACE after the EHXMS> prompt. Otherwise, go to the next step.
3. Enter MEMORY_SIZE n after the EHXMS> prompt, where n is the memory size in kilobytes. For a 1-megabyte system (one MSV11-Q module or two MSV11-P modules) n is 1024. For a 2-megabyte system (two MSV11-Q modules), n is 2048.
4. Enter START after the EHXMS> prompt.

If you want to run a particular test (tests are listed later in this section) enter START and the number of the test to run. If you do not enter a number, the diagnostic starts at the first test. Once you enter the START command, the test begins.

The diagnostic loops through the specified test(s) until you stop it with a CTRL/C.

You can stop the memory test at any time and return to the EHXMS> prompt by pressing CTRL/C. To exit the diagnostic, press the **Halt** pushbutton on the system unit front control panel.

The tests are as follows:

1. **CSR Function Test** — This test determines the number of CSRs present and verifies that they retain settings and clear correctly when the Q22 bus is initialized.
2. **Memory Configuration Test** — This test verifies the size of memory and memory contiguity and verifies CSR/memory correlation.
3. **Memory Address Test Part 1** — This test writes the memory address into memory one longword at a time.
4. **Memory Address Test Part 2** — This test writes the two's complement of the memory address into memory one word at a time.
5. **Memory Address Test Part 3** — This test writes the 16 kilobyte bank number into memory one byte at a time.

6. **Memory Address Test Part 4** — This test writes the twos complement of the 16 kilobyte bank number into memory one byte at a time.
7. **Worst Case Noise Test** — This test writes a series of test patterns throughout memory one word at a time. These patterns include testing for stuck-at-0, stuck-at-1 and worst case word parity cases.
8. **Memory Parity Test** — This test forces bad parity to be written into each byte of memory, together with a set of worst case patterns. This test is only executed if the PARITY option is enabled with the ENABLE PARITY command.
9. **DATIO Test** — This test uses the Q22 bus DATIO operation to write data a word at a time into memory.
10. **DATIOB Test** — This test writes data a byte at a time into memory using the Q22 bus DATIOB operation.
11. **Instruction Execution Test** — This test executes a series of simple instruction sequences throughout memory.
12. **Marching Ones and Zeros Test** — Each 16 kilobyte bank of memory is exercised by running several passes of alternating bytes of ones and zeros through the bank. Memory refresh and quadword memory references are also checked.

Other Commands

HELP

Use the HELP command to display descriptions of the Memory diagnostic commands, options, and syntax.

DISABLE

Use the DISABLE command to disable options that are enabled. You can display the options by entering the HELP command.

ENABLE

Use the ENABLE command to enable options that are disabled.

VIEW

Use the VIEW command to list the status of the ENABLE or DISABLE command options as well as the specified memory size. For example,

```
EHXMS> VIEW  
  
Options status: BELL = ENABLED, ERRORS = ENABLED,  
                HALT = ENABLED, LOOP = DISABLED,  
                MAP = ENABLED, PARITY = ENABLED,  
                RELOCATION = ENABLED, TRACE = DISABLED  
  
Memory size = 1024 Kb
```

Memory Diagnostic Error Messages

The diagnostic issues an error message for each error it encounters. The format of the error message depends on the cause of the error: 1) an invalid command entered by you, or 2) an error in the memory under test.

Error messages produced as a result of incorrect input have the format:

EHXMS — [text]

The message text can be:

EHXMS — Command [command name] is unknown. Try HELP for help information.

EHXMS — The [command name] command takes no arguments. Excess user input [input] ignored.

EHXMS — The [command name] command accepts an optional decimal number. [text] is not decimal.

EHXMS — The [command name] command requires an argument.

EHXMS — [command name] is not a valid DISABLE or ENABLE option keyword. Try HELP for help information.

EHXMS — Test number [number] is incorrect. Test numbers range from 1 to 12.

EHXMS — The memory size specified is incorrect; valid memory sizes range from 256 to 4096 kilobytes.

EHXMS — The memory size specified is incorrect; valid memory sizes are multiples of 256 kilobytes.

Other error messages result from an error in the memory under test. If one of these messages is displayed, **write it down** and contact your support person for help.

VDS DIAGNOSTICS

The VDS diagnostics are on the diskettes that come with your system unit labeled MICROVAX DIAGNOSTICS 2 and MICROVAX DIAGNOSTICS 3.

You boot each diagnostic while in console mode. Enter console mode by pressing the **Halt** pushbutton on the front control panel twice.

CAUTION

Before entering console mode, always make sure that you close any open files and log out of any open accounts.

Once the diagnostic is booted, you enter VDS commands in the order described in the following sections. Table 8-2 summarizes The VDS commands you need to use.

Table 8-2: VDS Command Summary

Command/ Qualifier	Function
ATTACH	Defines the device to be tested. Information specified in the command line includes, in order: • The device type. • The link type. • The device name. • The base control and status register (CSR) address in octal. • The base vector address in octal, if applicable.
DEATTACH	Corrects a mistake made in using the ATTACH command.
HELP	Displays useful information about each diagnostic.
HELP EHXnn	Where nn is the specific diagnostic mnemonic, displays information about the diagnostic.
LOAD	Copies the diagnostic into system memory in preparation for execution.
/PASSES = x	Allows multiple passes to be run.
RUN	Loads and starts the diagnostic. Used instead of the LOAD and START commands in some situations.
/SECTION = name	Identifies a specific test to be run on a particular device. Otherwise, the diagnostic runs through the default tests. Details on the /SECTION qualifier are in the diagnostic descriptions that follow.
SELECT	Identifies the device to be tested.
SET EVENT_FLAG n	Sets up a particular condition for the test to be run in; for example, the duration of the test. Not applicable to all diagnostics.
START	Executes the test.

The diskette labeled "MICROVAX DIAGNOSTICS 2" contains the DLVJ1, DZV11, DEQNA, and Storage Subsystem diagnostics.

The diskette labeled "MICROVAX DIAGNOSTICS 3" contains the VCB01, RC25, and DHV11 diagnostics.

Only the diagnostics for VAXstation I modules and option modules are described in this book.

When the VDS diagnostics are running, the monitor screen display may become jumpy. This is normal behavior.

To abort the testing and return to the DS> prompt, type CTRL/C. To exit VDS completely, type EXIT at the DS> prompt.

VCB01 DIAGNOSTIC

The VCB01 diagnostic, which tests the VCB01 module, is on the diskette labeled "MICROVAX DIAGNOSTICS 3." The first 12 tests of this diagnostic take approximately two minutes. The time for the last two tests depends on operator control.

How to Run the VCB01 Diagnostic

1. Enter console mode by pressing the **Halt** pushbutton twice.
2. Load the diskette labeled "MICROVAX DIAGNOSTICS 2" in diskette drive 1.
3. Enter the following command:

```
>>> B/10 DUA1
```

The VDS header appears with the DS> prompt.

4. Load the diskette labeled "MICROVAX DIAGNOSTICS 3" in diskette drive 2.
5. Enter the following commands:

```
DS> ATTACH RX50 DUA DUA2
DS> SET LOAD DUA2:[SYS0,SYSMAINT]
```

6. Enter the LOAD command as follows:

```
DS> LOAD EHXVS
```

7. Enter the ATTACH command as follows:

```
DS> ATTACH VCB01 HUB VCB0 777200 100
```

8. Enter the SELECT command as follows:

```
DS> SELECT VCB0
```

9. If you suspect loss of video data (in other words, the screen display looks like it is missing some dots), increase the time that the Refresh test (described later) runs by setting event flag 2 as follows. Otherwise, go to the next step.

```
DS> SET EV 2
```

If you include this command, you will be prompted when testing begins for the number of seconds to run the test (from 0 to 327679). Usually, it is necessary to run the test for only a few minutes.

10. Enter the following command to run the diagnostic:

```
DS> START
```

The diagnostic runs through the first 12 tests described in the next section.

11. If a message indicates a problem with the VCB01, contact your support person for help.

To abort the testing and return to the DS> prompt, press CTRL/C. To exit VDS, type EXIT at the DS> prompt.

VCB01 Diagnostic Test Sequence

The VCB01 diagnostic consists of the following tests.

Test #	Name/Description	Section
Test 1:	Register Probe Test	* MEMORY
Test 2:	Memory Bitmap Test	* MEMORY
Test 3:	Interrupt Controller Register R/W Test	* INTERRUPT
Test 4:	Interrupt Controller Interrupt Test	* INTERRUPT
Test 5:	DUART Register R/W Test	* DUART
Test 6:	DUART Loopback Test	* DUART
Test 7:	DUART Interrupt Driven Loopback Test	* DUART,INTERRUPT
Test 8:	Cursor Position Test	* CURSOR
Test 9:	Scan Line Map Test	* MEMORY
Test 10:	Mouse Counter Test	* MOUSE,INTERRUPT
Test 11:	Memory Refresh Test	* MEMORY,REFRESH
Test 12:	Visual Video Odd/Even Generator Test	* MEMORY
Test 13:	Mouse & Keyboard Interaction Tests	OPERATOR
Test 14:	Alignment Pattern Generator	ALIGN

* DEFAULT

Selecting Sections

The VCB01 diagnostics contains nine sections: DEFAULT, MEMORY, DUART, INTERRUPT, CURSOR, MOUSE, REFRESH, OPERATOR, and ALIGN. All tests are contained in the DEFAULT section except the alignment pattern generator and the operator intervention tests. They are contained in the ALIGN and OPERATOR sections respectively.

Use the /SECTION argument to select a section other than DEFAULT. For example:

```
DS> RUN EHXVS/SECTION=REFRESH
```

With the exception of DEFAULT and OPERATOR, the section names identify the part of the device they test. For example, the INTERRUPT section contains the tests using interrupts during testing.

DEFAULT Section

The DEFAULT section contains tests 1 through 12. This section is run when you do not select a different section.

REFRESH Section

The REFRESH section contains a memory refresh circuitry test. If event flag 2 is set, a prompt asks for the number of seconds to run the test. If the flag is not set, the test runs 20 seconds.

OPERATOR Section

The OPERATOR section contains the interactive mouse and keyboard test. To exit this test, press the leftmost mouse key or the CTRL key on the keyboard three consecutive times.

ALIGN Section

The ALIGN section contains only the Alignment Pattern Generator. The section displays the alignment pattern on the screen. Press CTRL/C to return to the DS> prompt. This test is used by repair personnel to adjust the CRT display screen.

DZV11 DIAGNOSTIC

The DZV11 diagnostic (EHXDZ) verifies the operation of the DZV11 4-channel asynchronous serial interface. After running this diagnostic, you can identify a DZV11 module that failed, if any.

The DZV11 diagnostic is on the diskette labeled "MICROVAX DIAGNOSTICS 2." The diagnostic takes approximately five minutes to run.

How to Run the DZV11 Diagnostic

1. Press the power switch to the off (0) position.
2. Remove the rear cover of the system unit.
3. Disconnect all external cables from the system unit DZV11 patch panel.
4. Press the power switch to the on (1) position.
5. Enter console mode by pressing the **Halt** pushbutton twice.
6. Load the DZV11 diagnostic diskette into diskette drive 1 and enter the following BOOT command:

```
>>> B/10 DUA1
```

7. Press **Return** and the VDS header is displayed, followed by the DS> prompt.
8. Enter the following ATTACH command:

```
DS> ATTACH DZV11 HUB TTA 760100 300
```

This command attaches the first DZV11 installed. To attach a second DZV11 installed, use TTB instead of TTA.

9. Enter the following SELECT command:

```
DS> SELECT TTA
```

This command selects the first DZV11 installed. To select a second DZV11, use TTB.

10. Run EHXDZ as follows:

```
DS> RUN EHXDZ
```

This test, called the Internal Test, runs through tests 1 to 19 listed in the next section. An internal loopback mechanism routes all characters transmitted on a particular channel back to that same channel's input receiver. All four channels are tested.

11. Check the display for failure messages. If the message indicates a user error, correct the error and rerun the diagnostic. If the message indicates a faulty module, contact your support person for help.

DZV11 Diagnostic Test Sequence

The DZV11 diagnostic consists of the following tests:

1. **CSR Test** — This test accesses the CSR and manipulates each register bit.
2. **TCR Test** — This test accesses the TCR and manipulates each register bit.

3. **Transmit Ready Flag Test** — This test checks the transmit ready flag. Only one channel is used.
4. **Transmit Interrupt Test** — This test verifies that the transmit interrupt occurs and is at the correct priority.
5. **Maintenance Mode Test** — This test verifies that the maintenance mode loopback works correctly.
6. **Receive Interrupt Test** — This test verifies that the receive interrupt occurs and is at the correct priority.
7. **Interrupt Precedence Test** — This test verifies that a receive interrupt will take precedence over a transmit interrupt.
8. **Transmit Ready Test** — This is the same as test 3 with the exception that all four channels are tested.
9. **Transmit Interrupt Test** — This is the same as test 4 with the exception that all four channels are tested.
10. **Baud Rate Timing Test** — This test verifies that increasing the baud rate decreases the interval between transmit interrupts.
11. **Maintenance Mode Test** — This is the same as test 5 with the exception that all four channels are tested.
12. **Receive Interrupt Test** — This is the same as test 6 with the exception that all four channels are tested.
13. **Character Length Test** — This test verifies that all four channels can transmit characters of all four possible bit lengths.
14. **Stop Bit Test** — This test verifies that all four channels can be set for all three possible stop bit configurations.
15. **Parity Bit Test** — This test verifies that all four channels can transmit characters for all three possible parity bit settings.
16. **Overrun Bit Test** — This test verifies that the DZV11 can detect an overrun condition.
17. **LPR Byte Access Test** — This test verifies that byte access to the LPR works correctly.
18. **Silo Bit Test** — This test verifies that all silo memory bits are functional and the silo alarm is generated under the right conditions.
19. **Dynamic Test** — This test verifies that all lines function at full speed and function when dynamic changes are made to programmable line parameters.
20. **Modem Control Test (Modem and Staggered Section)** — This test verifies the modem control functions. The test requires that an operator insert an H329 connector. Contact your support person to run this test.

21. **Dynamic Test (Staggered Section)** — This test is similar to test 19, with the exception that tests are performed in staggered loopback mode. It requires that an operator insert an H329 connector. Contact your support person to run this test.
22. **Echo Test (Echo Section)** — See the following description. This test requires that an operator insert an H329 connector.

Echo Test

This type of testing requires a terminal to be connected to the DZV11 through the patch panel. The command to run this test is:

```
DS> RUN EHXDZ/SECTION=ECHO
```

Test 22 is performed to test a single channel. When echo testing is started, the VDS header is displayed, followed by the message:

```
THIS TEST REQUIRES A TERMINAL CONNECTED TO A  
DZV11 CHANNEL
```

After you receive this message, attach your test terminal to one of the DZV11 channels at the rear patch panel assembly. You are then prompted to enter the channel number to be tested. The channel numbers are, from top to bottom or right to left, TTA0:, TTA1:, TTA2:, and TTA3: for the first installed DZV11 module.

After you enter the channel number, you are prompted for the the character size in bits, the number of stop bits, the parity, and the baud rate. After answering these prompts, the following message appears on the test terminal:

```
EACH CHARACTER YOU ENTER WILL BE ECHOED  
THROUGH THE DZV11. ENTER A CONTROL-Z TO STOP  
THE TEST.
```

Now, all characters you type at the test terminal are echoed at that terminal. Pressing CTRL/Z ends the test and produces the following message on the console terminal:

```
CONTROL-Z RECEIVED FROM CHANNEL NUMBER x
```

Channel number x is the number of the DZV11 channel to which the test terminal is connected.

STORAGE SUBSYSTEM DIAGNOSTIC

The Storage Subsystem diagnostic (EHXRQ) verifies the operation of the mass storage subsystem.

Additionally, this diagnostic enables you to format the RD52 drive.

NOTE

The default test section is the multidisk exerciser.

CAUTION

The default diagnostic action destroys any data on disks that are write enabled. Make sure the diagnostic diskette is write protected before starting the diagnostic. Testing on write protected disks is limited to read-only operations.

The Storage Subsystem diagnostic is distributed on the diskette labeled "MICROVAX DIAGNOSTICS 2." The diagnostic takes up to seven minutes per RX50 and up to five minutes per RD52 to run. This diskette should have the silver write protect tab on it.

Disk and Controller Exerciser

The disk and controller exerciser section, the test run by default, consists of a standard test sequence that tests the RQDX1 controller and the RD/RX disk drives.

A typical user I/O load is simulated. All selected tests are subjected to a series of random READ, WRITE (if the disk is write enabled), and ACCESS commands.

How to Run the Disk and Controller Exerciser

The following procedure tests the RD52 and RX50 drives. You can vary the procedure to test fewer or more diskette or disk drives.

1. Write protect the disk by pressing the **Fixed Disk Write Protect** push-button on the system unit front control panel to the in position (light on).
2. Locate two scratch diskettes.
3. Load one of the scratch diskettes in diskette drive 2.
4. Load the diagnostic diskette in diskette drive 1 and enter the following BOOT command:

```
>>> B/10 DUA1
```

The VDS header appears with the DS> prompt.

5. Enter the LOAD command:

```
DS> LOAD EHXRQ
```

6. Remove the diagnostic diskette from diskette drive 1.

CAUTION

If you do not remove this diskette and if it is not write protected, you will destroy the diagnostic.

7. Insert the second scratch diskette in diskette drive 1.
8. Enter the following ATTACH commands:

```
DS> ATTACH RQDX1 HUB DUA 772150
DS> ATTACH RD52 DUA DUA0
DS> ATTACH RX50 DUA DUA1
DS> ATTACH RX50 DUA DUA2
```

9. Enter the following SELECT command:

```
DS> SELECT DUA0,DUA1,DUA2
```

10. Enter the START command:

```
DS> START
```

11. The diagnostic prompts you to confirm write testing on a disk or diskette drive that is write enabled. Answering Y (yes) continues the test. Answering N (no) discontinues the test. By default each drive selected is tested in turn.

The diagnostic will display the results of the test after it completes execution.

12. If a message indicates faulty hardware, contact your support person for help.

Disk Drive Formatting

This test section is used to hardware-format an RD52 drive. Formatting RX50 diskettes is not supported; they must be formatted at the factory.

The disk drive you receive with your VAXstation I has already been formatted. The formatting procedure described here is for replacement drives or if you want to destroy all your disk data and start over. Formatting a disk **always** destroys any data on the disk. To help ensure that you do not accidentally destroy any important stored data, the formatting software prompts you to confirm that you wish to continue with formatting for each drive selected.

Formatting an RD52 takes approximately 25 minutes.

CAUTION

This diagnostic destroys any user data on the disks formatted.

Use the disk formatter to format the RD52 disk drive before first use. The disk formatter prompts you for:

- The date.
- The serial number of the disk drive. **Do not remove your disk to locate the serial number.** You can enter any number you want that consists of 1 to 8 numerals (no letters).

The following example illustrates the disk drive formatting procedure:

```
DS> ATTACH RQDX1 HUB DUA 772150
DS> ATTACH RD52 DUA DUA0
DS> SELECT DUA0
DS> RUN EHXRQ/SECT=FORMAT

..PROGRAM: RQDX1 Functional Test, ZZ-EHXRQ, revision 1.0, 24 tests at 08:55:03.12
Testing _DUA0

Enter today's date (dd-mmm-yy) 11-JAN-84
Enter volume serial number (NNNNNNNN) 04050104
Previous disk contents will be destroyed, is this correct? YES

..End of run, 0 errors detected, Pass count is 1, time is 11-JAN-1984 09:03:45.64
DS>
```

Example 8-3: Sample Disk Drive Formatting Output**DEQNA DIAGNOSTIC**

The DEQNA diagnostic (EHXQN) verifies the operation of the DEQNA Ethernet communications module. After running this diagnostic, you can identify a module that failed, if any.

Diagnostic Distribution

The DEQNA diagnostic is on the diskette labeled "MICROVAX DIAGNOSTICS 2." The diagnostic takes approximately 5 minutes to run.

How to Run the DEQNA Diagnostic

1. No special setup procedures are required to run the default test. However, to run one of the tests, the external test, a support person must install the data loopback connector (part number 12-22196-01) on the DEQNA module. To run another of the tests, the network test, you must connect your system to a functioning Ethernet.

2. Insert the diagnostic diskette into the RX50 diskette drive 1 and enter the following BOOT command:

```
>>> B/10 DUA1
```

The VDS header appears, followed by the DS> prompt.

3. Enter the following ATTACH command for the first DEQNA installed:

```
DS> ATTACH DEQNA HUB XQA 774440
```

If you make a mistake in the ATTACH command, you must use the DEATTACH command and reenter the ATTACH command. For example:

```
DS> DEATTACH/ADA=HUB XQA
```

4. Enter the following SELECT command:

```
DS> SELECT XQA
```

If you have a second DEQNA installed, repeat the ATTACH and SELECT commands, using XQB.

5. Run the diagnostic, as follows:

```
DS> RUN EHXQN
```

6. If an error message indicates a faulty DEQNA, contact your support person for help.

Modes of DEQNA Diagnostic Testing

Three different modes of testing are provided by this diagnostic:

- Internal loopback, the default mode
- External test, using the loopback connector (part number 70-21489-01)
- Network testing, using a working Ethernet and another MicroVAX I or VAXstation I

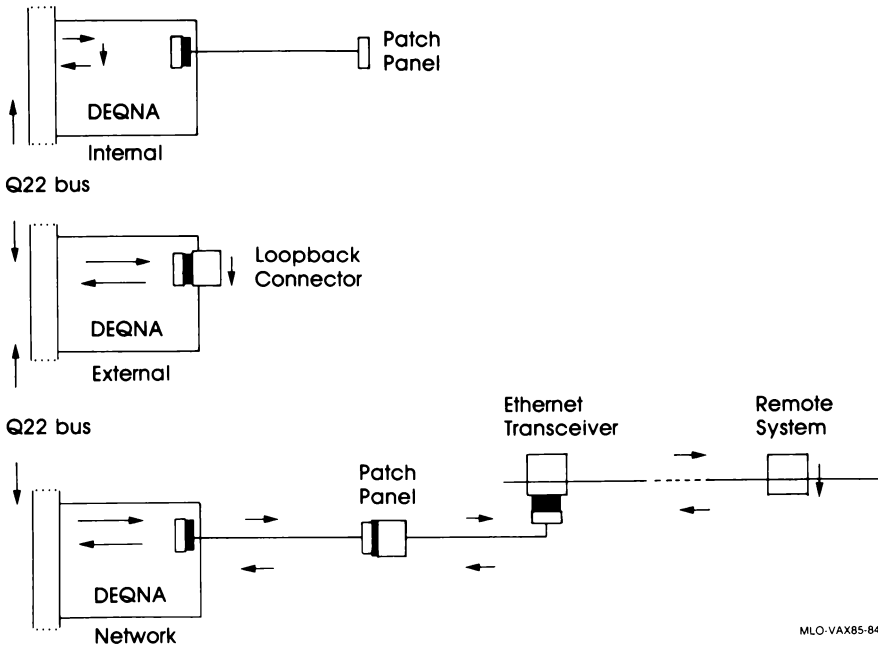
Figure 8-2 illustrates using these three test modes. Example 8-4 illustrates a sample diagnostic run.

Internal Test

This test performs only internal loopback testing. This procedure involves looping the data back within the DEQNA; no loopback data is output onto the Ethernet.

External Test

This test must be performed by support personnel. The DEQNA loopback connector must be installed on the module to run this test. Only external



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Figure 8-2: DEQNA Testing Modes

loopback testing is performed. This procedure involves transmitting the data as far as the loopback connector on the DEQNA module. The loopback connector loops the transmitted data back to the receive section of the module.

Network Test

Data flow testing requires the DEQNA to be connected to a functional Ethernet as shown in Figure 8-2. Additionally, another system must be present on the Ethernet and must participate in the tests. Data is passed between the two systems, the other system responds to Ethernet Configuration Testing Protocol. The Ethernet may be in general use while the test proceeds.

In order for the network confidence test to succeed, at least one system on the Ethernet must respond to Ethernet Configuration Test Protocol. That system must respond to requests directed to the loopback assistant multicast address (CF-00-00-00-00-00). This requirement is usually met by DECnet, without user assistance. However, if the diagnostic is unable to make contact with the loopback assistant, you may be required to run the Loopback test section on another MicroVAX I system that is connected to the network. The Loopback test section is run in the same way as other test sections. When started though, it loops indefinitely until stopped by CTRL/C.

```
DIAGNOSTIC SUPERVISOR, ZZ-EHSAA-6.12-308 11-AUG-1984 08:21:04
DS> ATTACH DEQNA HUB XQA 774440
DS> SELECT XQA
DS> RUN EHXQN

..PROGRAM: EHXQN DEQNA Diagnostic, revision 1.1, 14 tests at 08:55:03.12
Testing _XQA

The Ethernet physical station address of XQA is AA-03-44-43-41-44.

..End of run, 0 errors detected, Pass count is 1, time is 11-AUG-1984
09:03:45.64

DS> START/SECTION=NETWORK

PROGRAM: EHXQN DEQNA Diagnostic, revision 1.1, 14 tests, at 09:04:24.60
Testing XQA

The Ethernet physical station address for XQA is AA-03-44-43-41-44.

End of run, 0 errors detected, Pass count is 1,
time is 09:05:22.18

DS>
```

Example 8-4: Sample DEQNA Diagnostic Output

DHV11 Diagnostic

The DHV11 diagnostic (EHXDH) verifies the operation of the DHV11 asynchronous multiplexer that provides an interface between eight asynchronous serial data communications channels and any processor that supports Q22 bus devices.

Diagnostic Distribution

The DHV11 diagnostic is on the diskette labeled "MICROVAX DIAGNOSTICS 3." The test takes a little over 4 minutes to run.

How to Run the DHV11 Diagnostic

1. Press the sytem unit power switch to the off (0) position.
2. Remove the rear cover of the system unit.
3. Remove the cables attached to the DHV11 patch panel on the rear of the system unit.
4. Press the system unit power switch to the on (1) position.
5. Enter console mode by pressing the **Halt** pushbutton twice.
6. Load the diskette labeled "MICROVAX DIAGNOSTICS 2" in diskette drive 1.
7. Enter the following command:

```
>>> B/10 DUA1
```

The VDS header appears, followed by the DS> prompt.

8. Load the diskette labeled "MICROVAX DIAGNOSTICS 3" in diskette drive 2.
9. Enter the following commands:

```
DS> ATTACH RX50 DUA DUA2
DS> SET LOAD DUA2:[SYS0.SYSMAINT]
```

10. Enter the following LOAD command:

```
DS> LOAD EHxDH
```

11. Enter the following ATTACH command:

```
DS> ATTACH DHV11 HUB TXA 770500 300 4
```

12. Enter the following SELECT command:

```
DS> SELECT TXA:
```

This selects the first unit under test. To select a second unit, use TXB:.

13. Enter the following START command:

```
DS> START
```

This procedure runs the default test. Contact your support person if a message indicates a faulty DHV11 module or if you want further testing using a loop-back connector or terminal.

Appendix A

Console Interface

The console subsystem is a direct interface between you and the VAXstation I system hardware. This chapter describes the console commands, messages, and halt and error codes.

OPERATING MODES

The VAXstation I operates in two modes: program I/O (input/output) and console. When you power the system on, depending on the setting of an internal switch, the system can either boot automatically to program I/O mode or halt in the console mode. The VAXstation I is shipped with the switch set for automatic boot. For console mode, press the **Halt** pushbutton twice.

In the console mode, the console subsystem interprets and executes console commands that you issue from the console terminal. The console commands enable you to load (bootstrap) diagnostic or operating software into main memory, deposit or examine data, single step through a program, test the system, and carry out debugging procedures. This appendix describes these console commands.

CHANGING MODES

To switch from program I/O to console mode, press the **Halt** pushbutton on the front control panel. The button must be pushed again in order to execute in console mode.

Switch the mode from console to program I/O by issuing the **BOOT**, **START** or **CONTINUE** console commands or by pressing the **Restart** pushbutton. The **Halt** pushbutton must be out when this is done.

ISSUING CONSOLE COMMANDS

Issue console commands by typing a single character in response to the console mode prompt (**>>>**); for example, type **B** to issue the **BOOT** command. Commands may be issued in upper or lowercase; lowercase characters are echoed as uppercase characters.

Some commands, like the **DEPOSIT** command, may have arguments appended to them. The arguments could be qualifiers, an address, or data. Argu-

ments modify or further define the operation of the command. Command qualifiers must have a slash (/) character placed in front of them, for example:

```
>>>D/W/P
```

Specify command syntax exactly as described; for example, multiple spaces cannot be entered where a single space is required. Each input character is checked for validity as it is typed. If you enter an invalid character, an tone sounds and the invalid character is ignored. Pressing **Delete** or **CTRL/U** (holding down the **Control** key and typing **U** at the same time) aborts the command.

Carriage Return (RET), the normal line terminator, has been omitted from the command descriptions except where it is needed to describe a command.

Table A-1 lists the console commands and their functions.

Table A-1: Console Command Summary

Command		Function
B	Boot	Bootstraps (loads) the operating or diagnostic software.
C	Continue	Continues execution after a halt.
D	Deposit	Deposits data in a specified location.
E	Examine	Examines data from a specified location.
H	Halt	Included for compatibility with other systems. This command has no effect on the operation of the MicroVAX I system.
I	Initialize	Initializes the processor state.
N	Single Macro-Instruction Step	Executes one instruction.
S	Start	Begins execution at a specified address.
T	Test	Invokes Microverify.
U	Unjam	Initializes the Q22 bus.
X		Transfers binary data to or from physical memory.

CONTROL KEYS

The control keys listed in Table A-2 are valid for the VAXstation I.

Table A-2: Control Key Functions

Key	Control Function
CTRL/U	Aborts a command and returns the console command prompt (>>>).
Delete	Aborts a command and returns the console command prompt (>>>).
Return	Terminates a command string and executes it.

BOOT

The BOOT command bootstraps (loads) the operating or diagnostic software from the storage subsystem. Before it bootstraps the software, this command performs an initialize, an unjam, and a parity detect enable in the memory control status registers (CSRs).

Format

>>>B qualifier device-name

Arguments

qualifier. The optional /n qualifier, issued with the BOOT command, is a hexadecimal flag value that is passed to the bootstrap routine in general register R5. If you do not use this qualifier, the value 0 is passed in R5.

The values for n are as follows:

- 1 When MicroVMS is installed, displays the SYSBOOT> prompt.
- 8 BOOTBLOCK — Secondary bootstrap from bootblock. When this bit is set, the primary bootstrap skips the normal operation, which is to search the volume as a Files-11 volume. Instead, the primary bootstrap reads logical block number 0 of the volume and tests it for conformance with the bootblock format.
- 10 DIAGNOSTIC — Diagnostic bootstrap. When this bit is set, the secondary bootstrap is the image called [SYS0.SYMAINT]DIAGBOOT.EXE.
- 40 HEADER — Image header. If this bit is not set, the primary bootstrap transfers control to the first byte of the secondary bootstrap file. If this bit is set, the primary bootstrap transfers control to the address of the secondary bootstrap obtained from that file's image header.

80	NOTEST — Memory test inhibit. This flag disables parity checking during bootstrapping.
100	SOLICIT — Solicit file name. When this bit is set, the primary bootstrap prompts for the name of a secondary bootstrap file.
200	HALT — Halt before transfer. When this bit is set, it causes a Halt instruction to be executed before transferring control to the secondary bootstrap.
X0000000	TOPSYS. X can be any value from 0 through F(hex). The TOPSYS flag changes the top level directory name for system disks with multiple operating systems. For instance, if X = 1, the top level directory name is [SYS1. ...].

device-name. This optional argument supplies the bootstrap device name. If specified, it must be four characters. The next four characters supplied are taken as the device name. If you press the **Break, Return, Delete or Ctrl/U** keys, they are included in the four characters.

The device name is not checked; it is passed directly to the bootstrap routine through general register R0. If you do not specify a device name, the value 0 is passed. Table A-3 lists the valid device names.

If you use the /n qualifier with the command, supply the device name and separate it from the qualifier by a space.

Table A-3: BOOT Command Device Names

Device	Name
Disk unit 0	DUA0
Disk unit 1	DUA1
Disk unit 2	DUA2
Disk unit 3	DUA3
MRV11 PROM	PRA0
DEQNA	XQA0

Example

```
>>>B DUA0
```

This example shows a BOOT command requesting that a bootstrap operation be performed from disk unit 0.

CONTINUE

The CONTINUE command resumes macroinstruction execution after a halt condition has occurred. Processor initialization is not performed. The console enters program I/O mode.

Format

```
>>>C
```

Example

```
0002567E 06
>>>C
```

This example shows the program counter (PC) and the halt code, followed by the CONTINUE command.

DEPOSIT

The DEPOSIT command puts data into a specified memory address, general purpose register, internal processor register, or MicroVAX I machine-specific register. The registers are listed here and are further described in the *MicroVAX I CPU Technical Description*, Chapters 2 and 6.

Format

```
>>>D qualifier-list location data
```

Arguments

qualifier-list. This argument specifies qualifiers that you can apply to the DEPOSIT command. Table A-4 lists qualifiers. If you specify conflicting qualifiers, the last qualifier entered is used; for example, if you specify both /B and /W (in this order), /W is used.

location. This argument specifies the location for the data to be deposited. Table A-7 lists locations. The location argument is separated from qualifiers by one space.

data. This argument specifies the hexadecimal value. The data argument is separated from qualifiers and location arguments by one space.

Table A-4: DEPOSIT Command Qualifiers

Qualifier	Function
B	A byte of data is to be deposited.
W	A word of data is to be deposited.
L	A longword of data is to be deposited. This is the default address space for the DEPOSIT command.
P	Data is to be deposited at a physical memory address. This is the initial default address space for the DEPOSIT command.
V	Data is to be deposited at a virtual memory address.
G	Data is to be deposited in a general register. Only longword data is deposited in this register (a data length qualifier will be ignored.)
I	Data is to be deposited in an internal processor register. Only longword data is deposited in this register (a data length qualifier will be ignored). Table A-5 lists and describes these registers.
M	The data is to be deposited in a machine specific register. Only longword data is deposited in this register (a data length qualifier will be ignored). Table A-6 lists and describes these registers.

NOTE

Registers TEMP(0) through TEMP(15), RESULT0 through RESULT2, and the Size and Index registers, are used by the console microcode and any data deposited in them will probably be overwritten.

Table A-5: Internal Processor Registers

Register Address	Register Name	Mnemonic	Type	Category
0	Kernel Stack Pointer	KSP	R/W	1
1	Executive Stack Pointer	ESP	R/W	1
2	Supervisor Stack Pointer	SSP	R/W	1
3	User Stack Pointer	USP	R/W	1
4	Interrupt Stack Pointer	ISP	R/W	1
5	Reserved			4
6	Reserved			4
7	Reserved			4

(Continued on next page)

Table A-5: Internal Processor Registers (Cont.)

Register Address	Register Name	Mnemonic	Type	Category
8	P0 Base Register	P0BR	R/W	1
9	P0 Length Register	P0LR	R/W	1
A	P1 Base Register	P1BR	R/W	1
B	P1 Length Register	P1LR	R/W	1
C	System Base Register	SBR	R/W	1
D	System Length Register	SLR	R/W	1
E	Reserved			4
F	Reserved			4
10	Process Control Block Base	PCBB	R/W	1
11	System Control Block Base	SCBB	R/W	1
12	Interrupt Priority Level	IPL	R/W	1
13	AST Level	ASTLVL	R/W	1
14	Software Interrupt Request	SIRR	W	1
15	Software Interrupt Summary	SISR	R/W	1
16	Reserved			4
17	CMI Error Register	CMERR		4
18	Interval Clock Control	ICCS	R/W	2
19	Next Interval Count	NICR	W	3
1A	Interval Count	ICR	R	3
1B	Time of Year	TODR	R/W	3
1C	Console Storage Receiver Status	CSRS	R/W	4
1D	Console Storage Receiver Data	CSRD	R	4
1E	Console Storage Transmit Status	CSTS	R/W	4
1F	Console Storage Transmit Data	CSTD	W	4
20	Console Receive C/S	RXCS	R/W	1
21	Console Receive D/B	RXDB	R	1
22	Console Transmit C/S	TXCS	R/W	1
23	Console Transmit D/B	TXDB	W	1
24	Translation Buffer Disable	TBDR	R/W	3
25	Cache Disable	CADR	R/W	2

(Continued on next page)

Table A-5: Internal Processor Registers (Cont.)

Register Address	Register Name	Mnemonic	Type	Category
26	Machine Check Error Summary	MCESR	R/W	2
27	Cache Error	CAER	R/W	3
28	Accelerator Control/Status	ACCS		4
29	Accelerator Maintenance	ACCR		4
2A	Reserved			4
2B	Reserved			4
2C	Writable Control Store Address	WCSA		4
2D	Writable Control Store Data	WCSB		4
2E	Reserved			4
2F	Reserved			4
30	SBI Fault/Status	SBIFS	R/W	3
31	SBI Silo	SBIS	R	3
32	SBI Silo Comparator	SBISC	R/W	3
33	SBI Maintenance	SBIMT	R/W	3
34	SBI Error Register	SBIER	R/W	3
35	SBI Timeout Address	SBITA	R	3
36	SBI Quadword Clear	SBIQC	W	3
37	Initialize Bus	IORESET	W	2
38	Memory Management Enable	MAPEN	R/W	1
39	Translation Buffer Invalidate All	TBIA	W	1
3A	Translation Buffer Invalidate Single	TBIS	W	1
3B	Translation Buffer Data	TBDATA	R/W	3
3C	Microprogram Breakpoint	MBRK	R/W	3
3D	Performance Monitor Enable	PMR	R/W	3
3E	System Identification	SID	R	1
3F	Translation Buffer Check	TBCHK	W	1

Category Key:

- 1 = implemented as defined by VAX architecture
- 2 = implemented by MicroVAX I uniquely
- 3 = read as zero, no operation on writes
- 4 = access not allowed; results in reserved operand fault

Table A-6: Register Address Organization

ADDR	+ 0	+ 1	+ 2	+ 3
00	R0	R1	R2	R3
04	R4	R5	R6	R7
08	R8	R9	R10	R11
0C	R12	R13	R14	PC
10	TEMP(0)	TEMP(1)	TEMP(2)	TEMP(3)
14	TEMP(4)	TEMP(5)	TEMP(6)	TEMP(7)
18	TEMP(8)	TEMP(9)	TEMP(10)	TEMP(11)
1C	TEMP(12)	TEMP(13)	TEMP(14)	TEMP(15)
20	TEMP(16)	TEMP(17)	TEMP(18)	TEMP(19)
24	TEMP(20)	TEMP(21)	TEMP(22)	TEMP(23)
28	TEMP(24)	TEMP(25)	TEMP(26)	TEMP(27)
2C	TEMP(28)	TEMP(29)	TEMP(30)	TEMP(31)
30	RESULT0	RESULT1	RESULT2	Shift Count
34	PTR 1	PTS 2	*Pointer 1	*Pointer 2
38	Timer Control/Status (TMRC SR)	Reserved	Reserved	Reserved
3C	Reserved	Reserved	Reserved	Reserved
40	Constants ROM	Constants ROM	Constants ROM	Constants ROM
44	Constants ROM	Constants ROM	Constants ROM	Constants ROM
48	Constants ROM	Constants ROM	Constants ROM	Constants ROM
4C	Constants ROM	Constants ROM	Constants ROM	Constants ROM
50	Constants ROM	Constants ROM	Constants ROM	Constants ROM
54	Constants ROM	Constants ROM	Constants ROM	Constants ROM
58	Constants ROM	Constants ROM	Constants ROM	Constants ROM
5C	Constants ROM	Constants ROM	Constants ROM	Constants ROM
60	CON.DATA (UART data)	CON.STATUS (UART status)	CON.MODE (UART mode)	CON.CMD (UART command)
64	Reserved	Reserved	Reserved	Reserved
68	Size register	Index register	PSL.MODE	MISC register, bits <3:0
6C	PSL.EN (write), REQ.ST (read)	PSL.IPL (write), INT.SRC (read)	PSL.CC	ALU.CC
70	System ID	Option Switches	MISC register, bits <7:4	Boot ROM
74	Reserved	Reserved	Reserved	Reserved
78	IB.BYTE	IB.WORD	IB.SIZE	IB.LONG
7C	MEMORY DATA	MEMORY.DATA	MEMORY.DATA	MEMORY.DATA

Table A-7: DEPOSIT Command Locations

Location	Meaning
address	The address or register number where data is to be deposited. Only the lowest 8 digits are used.
*	The data is to be deposited at the last location deposited or examined in a previous DEPOSIT or EXAMINE command. If there was no previous EXAMINE or DEPOSIT command, location zero is used.
@	The data is to be deposited at the address represented by the last data examined or deposited.
+	The data is to be deposited at the last location deposited or examined in a previous DEPOSIT or EXAMINE command plus the size of the last data.
-	The data is to be deposited at the last location referenced in a previous DEPOSIT or EXAMINE command minus the size of the last data.
P	The data is to be deposited in the processor status longword.

Example

```
>>>D/W/P 10 1234
>>>D + 5678
>>>E/L 1}i0

P 00000010 56781234
```

This example begins by depositing a word in physical memory, starting at location 10. The second DEPOSIT command deposits another word in the next location (12). The EXAMINE command displays the longword starting at location 10.

EXAMINE

The EXAMINE command gives data from a specified memory address, general purpose register, internal processor register, or machine-specific register.

Format

```
>>>E qualifier-list location
```

Arguments

qualifier-list. This argument enables qualifiers to be specified. Table A-8 lists valid qualifiers. If you specify conflicting qualifiers, the last valid qualifier entered is used. For example, if you specify both /B and /W (in this order), /W will be used.

location. This argument specifies the location of the data to be examined. Table A-9 lists valid locations. The location argument is separated from any qualifiers by one space.

Table A-8: EXAMINE Command Qualifiers

Qualifier	Function
B	A byte of data is to be examined.
W	A word of data is to be examined.
L	A longword of data is to be examined. This is the initial default data size for the EXAMINE operation.
P	The data to be examined is at a physical memory address. This is the initial default address space for the EXAMINE operation.
V	The data to be examined is at a virtual memory address.
G	The data to be examined is in a general register. Only longword data is examined (a data length qualifier will be ignored).
I	The data to be examined is in an internal register. Only longword data is examined (a data length qualifier will be ignored). Table A-5 lists and describes these registers.
M	The data to be examined is in a machine specific register. Only longword data is examined (a data length qualifier will be ignored). Table A-6 lists and describes these registers.

NOTE

Registers TEMP (0) through TEMP (15), RESULT0 through RESULT2, and the Size and Index registers, are used by the console microcode and any data deposited in them will probably be overwritten.

Table A-9: EXAMINE Command Locations

Location	Meaning
address	The address or register number where the data is located. If a register number or address is supplied, only the lowest 8 digits are used.
*	The data to be examined is in the last location deposited or examined in a previous DEPOSIT or EXAMINE operation. If there was no previous EXAMINE or DEPOSIT command, location zero is used.
@	The data to be examined is at the address containing the last data deposited or examined.
+	The data to be examined is in the last location deposited or examined in a previous DEPOSIT or EXAMINE operation plus the size of the last data.
-	The data to be examined is in the last location referenced in a previous DEPOSIT or EXAMINE command minus the size of the last data.
P	The data to be examined is from the processor status longword.

Example

```
0000203E 06
>>>E/G/L F
G 0000000F 0000203E
>>>E/P/B @
P 0000203E D05150D0
```

HALT

The HALT command is included for compatibility with other systems. It has no effect on the VAXstation I.

Format

```
>>>H
```

Example

```
>>>H
```

INITIALIZE

The INITIALIZE command initializes the processor. The following action takes place:

- The console terminal baud rate is set to 9600.
- The processor status longword is set to 1F0000 (hexadecimal).

- The asynchronous system trap level is set to 4.
- The interval timer control status register is initialized to 0.
- The data cache is flushed and then enabled.
- The map enable register is initialized to 0.
- The console UART (Universal Asynchronous Receiver Transmitter) is initialized, the baud rate is set, and interrupts are disabled.

Format

```
>>>I
```

Example

```
>>>I
```

SINGLE MACROINSTRUCTIONS STEP

The SINGLE MACROINSTRUCTION STEP command executes one macroinstruction and then halt. The processor halts in the console mode.

Format

```
>>>N
```

Example

If you type N, the system will execute one macroinstruction. Then type a space, the next instruction address and the next longword value, followed by a carriage return and line feed:

```
>>>N 1234F20B155051A3
>>>
```

START

The START command enables you to begin processor execution at a specified address. The processor is initialized before execution begins.

Format

```
>>>S location
```

Arguments

location. This argument is a hexadecimal number that represents the address where processor execution is to begin.

Example

```
>>>S 200
```

TEST

The TEST command executes the Microverify routine. When the Microverify routine begins, the message "MICROVERIFY STARTED" is displayed on the console terminal. When Microverify completes, a second message is displayed. The second message informs you whether Microverify passed or failed. Microverify is described in Chapters 7 and 8.

Microverify can run in two modes. A jumper on the DAP module causes Microverify to run in the single pass mode. The system is shipped to you with the jumper installed. The messages described above are returned. With the jumper removed, Microverify runs in the infinite loop mode. In this mode, additional lines of text are returned. They aid in isolating faults and are intended for DIGITAL use only.

Format

```
>>>T
```

Example

```
>>>T  
MICROVERIFY STARTED  
MICROVERIFY PASSED
```

This example represents a successful Microverify run in single pass mode (jumper in).

UNJAM

The UNJAM command resets the system by initializing the Q22 bus. The command is useful when debugging.

Format

```
>>>U
```

Example

```
>>>U
```

X

The X command transfers binary data to and from physical memory starting at the specified address.

NOTE

This command is intended for use by DIGITAL personnel only.

Format

>>>X location count CR checksum

Arguments

location. This argument specifies the physical address into or from which that binary data is to be copied. The physical address is expressed as a hexadecimal number.

count. This argument specifies in hexadecimal the number of bytes to be transferred. If the high-order bit is a one, data transfer is from the physical memory to the console terminal. If the high-order is a zero, data transfer is from the console terminal to physical memory.

CR. Carriage Return.

checksum. This argument specifies the two's complement checksum of the command string or data. The checksum is one byte of data expressed as a 2-digit hexadecimal number.

CONSOLE MESSAGES AND CODES

When the CPU halts, it will print either a message, or the address contained in the program counter (PC) and a 2-digit hexadecimal halt code (Table A-10).

Console Messages

Messages are printed on the console when the system is attempting a bootstrap operation, a restart operation, or when Microverify is running:

```
ATTEMPTING BOOTSTRAP
ATTEMPTING RESTART
MICROVERIFY STARTED
```

If the bootstrap or restart is successful, you will not receive any further console messages. If the bootstrap or restart fails, you will receive one of the following messages:

```
BOOTSTRAP FAILED
RESTART FAILED
```

When Microverify finishes, you will receive one of the following messages:

```
MICROVERIFY PASSED
MICROVERIFY FAILED
```


Console Halt Codes**Table A-10: Console Halt Codes**

Code	Meaning
00	Not used.
01	Microverify succeeded.
02	Console Halt/Break.
03	Power up
04	The interrupt stack was not valid when the processor tried to push the program counter (PC)/processor status longword (PSL) during an exception or an interrupt condition.
05	A second machine check occurred while the processor was processing an existing machine check.
06	A HALT instruction was executed while the processor was in kernel mode.
07	Not used.
08	Not used.
09	Not used.
0A	A CHMx instruction was executed when the processor was executing on the interrupt stack.
0B	Not used.
0C	A hard memory error occurred while the processor was trying to read a system control block (SCB) vector.
0D-FE	Not used.
FF	Microverify failed.

Console Error Codes

Table A-11: Console Error Codes

Code	Meaning
?11	An attempt has been made to examine data from or deposit data into an illegal internal processor register.
?7F	An attempt has been made to examine data from or deposit data into an illegal machine register.
?20	Machine check resulting from, for example, trying to examine data from nonexistent memory.
?30	Checksum error in an X command.

Appendix B

Tektronix 4010/4014 Terminal Emulation

GENERAL

This appendix describes the features of industry-standard Tektronix 4010/4014-based software that is supported by VAXstation I 4010/4014 terminal emulation. This appendix assumes a working knowledge of Tektronix 4010/4014 functions.

4010/4014 terminal emulation supports those features of 4010/4014 terminals that can be migrated from direct-view storage tube technology to the raster-scan technology used by the VAXstation.

4010/4014 terminal emulation supports industry-standard Tektronix 4010/4014 software packages. This appendix describes known differences from the 4010/4014.

IMPLEMENTATION

4010/4014 terminal emulation supports the following modes and functions:

- Alpha Mode — processes text characters.
- Graph Mode — processes vectors from endpoints defined by absolute coordinate values.
- Point Plot Mode — similar to graph mode except only the points specified by the absolute coordinate values are plotted; no vector is drawn between the points.
- Graphic Input (GIN) Mode — a local crosshair cursor used for selecting items.
- Strap Options — supported as workstation setup options.
- Control Characters — ASCII control characters used to define action to be taken by the terminal.
- Escape Sequences — supports escape sequences that control and/or define 4010/4014 functions.
- Bypass Condition — inhibits terminal from responding to data echoed by the host.

IMPLEMENTATION RESTRICTIONS

Because of the differences between direct-view and raster-scan display technologies, some functions are not implemented in the VAXstation I (or implemented in a limited fashion). The following is a description of these limitations:

1. A fallout of storage tube technology is “write-through” mode, in which images are drawn on the tube, but not retained. These images need to be refreshed to be visible, with their intensity dependent on the refresh rate. In 4010/4014 series terminals, “write-through” can be used for alpha mode characters, as well as for graphic images. “Write-through” cannot be implemented as such in the raster-scan technology used by the VAXstation.
2. The Tektronix Enhanced Graphics Module (EGM) is a 4014 option that provides a number of special features. The VAXstation I implements a number of the features available through the EGM-option. However, special point plot and incremental plot are not implemented in the VAXstation I.

SCREEN ADDRESSING

4010/4014 series terminals use Tekpoints as their unit of screen addressing. By default, there is a 1024 X 820 addressable Tekpoint matrix. The default matrix is used in graphics input (GIN) mode.

SETUP SUPPORT

4010/4014 terminals have four strap options selectable by moving jumper wires on the terminal’s circuit cards. The VAXstation I supports the Ignore Del and Gin terminators.

ASCII CHARACTER CODES

Table B-1 shows the 7-bit ASCII codes.

Table B-1: 7-Bit ASCII Codes

ROW	COLUMN				0	1	2	3	4	5	6	7
	BITS b7 b6 b5 b4 b3 b2 b1				0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
1	0	0	0	1	SOH	DC1 (XON)	!	1	A	Q	a	q
2	0	0	1	0	STX	DC2	"	2	B	R	b	r
3	0	0	1	1	ETX	DC3 (XOFF)	#	3	C	S	c	s
4	0	1	0	0	EOT	DC4	\$	4	D	T	d	t
5	0	1	0	1	ENQ	NAK	%	5	E	U	e	u
6	0	1	1	0	ACK	SYN	&	6	F	V	f	v
7	0	1	1	1	BEL	ETB	'	7	G	W	g	w
8	1	0	0	0	BS	CAN	(	8	H	X	h	x
9	1	0	0	1	HT	EM	)	9	I	Y	i	y
10	1	0	1	0	LF	SUB	*	:	J	Z	j	z
11	1	0	1	1	VT	ESC	+	;	K	[	k	{
12	1	1	0	0	FF	FS	,	<	L	\	l	
13	1	1	0	1	CR	GS	-	=	M	]	m	}
14	1	1	1	0	SO	RS	.	>	N	^	n	~
15	1	1	1	1	SI	US	/	?	O	_	o	DEL

KEY

CHARACTER	ESC	33	OCTAL
		27	DÉCIMAL
		1B	HEX

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Table B-2 summarizes the ASCII character code functions supported in the four operational modes of the 4010/4014.

Table B-2: ASCII Character Code Function Summary

ASCII Char.	Alpha	Graph	Operational Mode Value Bypass/GIN	LCE Flag (note 1)
NUL				SET LCE
SOH				
STX				
ETX				
EOT				
ENQ				RETURN TERMINAL STATUS
ACK				
BEL	RING BELL	RING BELL	RING BELL	RING BELL
BS	MOVE ONE SPACE LEFT			MOVE ONE SPACE LEFT
HT	MOVE ONE SPACE RIGHT			MOVE ONE SPACE RIGHT
LF	MOVE ONE LINE DOWN	MOVE DOWN	MOVE ONE LINE DOWN	SET LCE (note 2)
VT	MOVE ONE LINE UP			MOVE ONE LINE UP
FF				ERASE AND HOME (PAGE)
CR	MOVE TO LEFT MARGIN	SET ALPHA AND LEFT	SET ALPHA AND LEFT	SET LCE (note 2)
S0				
S1				
DLE				
DC1				
DC2				
DC3				

DC4				
NAK				
SYN				
ETB				
CAN				SET BYPASS
EM				
SUB				SET GIN AND BYPASS
ESC	SET LCE	SET LCE	SET LCE	SET LCESET LCE
FS	SET POINT PLOT	SET POINT PLOT	SET POINT PLOT	
GS	SET GRAPH & DARK VECTOR	DO A DARK VECTOR	SET GRAPH & DARK VECTOR	SET GRAPH & DARK VECTOR
RS				
US		SET ALPHA MODE	SET ALPHA MODE	SET ALPHA MODE
SPACE	MOVE ONE SPACE RIGHT	HIGH X OR HIGH Y		
!	PRINT CHARACTER	HIGH X OR HIGH Y		
"	PRINT CHARACTER	HIGH X OR HIGH Y		
#	PRINT CHARACTER	HIGH X OR HIGH Y		
\$	PRINT CHARACTER	HIGH X OR HIGH Y		
%	PRINT CHARACTER	HIGH X OR HIGH Y		
&	PRINT CHARACTER	HIGH X OR HIGH Y		
'	PRINT CHARACTER	HIGH X OR HIGH Y		
(	PRINT CHARACTER	HIGH X OR HIGH Y		
)	PRINT CHARACTER	HIGH X OR HIGH Y		
*	PRINT CHARACTER	HIGH X OR HIGH Y		
+	PRINT CHARACTER	HIGH X OR HIGH Y		

(Continued on next page)

Table B-2: ASCII Character Code Function Summary (Cont.)

ASCII Char.	Alpha	Graph	Operational Mode Value	
			Bypass	GIN
'	PRINT CHARACTER	HIGH X OR HIGH Y		
-	PRINT CHARACTER	HIGH X OR HIGH Y		
.	PRINT CHARACTER	HIGH X OR HIGH Y		
/	PRINT CHARACTER	HIGH X OR HIGH Y		
0	PRINT CHARACTER	HIGH X OR HIGH Y		
1	PRINT CHARACTER	HIGH X OR HIGH Y		
2	PRINT CHARACTER	HIGH X OR HIGH Y		
3	PRINT CHARACTER	HIGH X OR HIGH Y		
4	PRINT CHARACTER	HIGH X OR HIGH Y		
5	PRINT CHARACTER	HIGH X OR HIGH Y		
6	PRINT CHARACTER	HIGH X OR HIGH Y		
7	PRINT CHARACTER	HIGH X OR HIGH Y		
8	PRINT CHARACTER	HIGH X OR HIGH Y		LARGE CHARACTER SIZE
9	PRINT CHARACTER	HIGH X OR HIGH Y		2 CHARACTER SIZE
:	PRINT CHARACTER	HIGH X OR HIGH Y		SMALL CHARACTER SIZE
;	PRINT CHARACTER	HIGH X OR HIGH Y		3 CHARACTER SIZE
<	PRINT CHARACTER	HIGH X OR HIGH Y		
=	PRINT CHARACTER	HIGH X OR HIGH Y		
	PRINT CHARACTER	HIGH X OR HIGH Y		
?	PRINT CHARACTER	HIGH X OR HIGH Y		LOW Y FOR GRAPH (note 3)

@	PRINT CHARACTER	LOW X
A	PRINT CHARACTER	LOW X
B	PRINT CHARACTER	LOW X
C	PRINT CHARACTER	LOW X
D	PRINT CHARACTER	LOW X
E	PRINT CHARACTER	LOW X
F	PRINT CHARACTER	LOW X
G	PRINT CHARACTER	LOW X
H	PRINT CHARACTER	LOW X
I	PRINT CHARACTER	LOW X
J	PRINT CHARACTER	LOW X
K	PRINT CHARACTER	LOW X
L	PRINT CHARACTER	LOW X
M	PRINT CHARACTER	LOW X
N	PRINT CHARACTER	LOW X
O	PRINT CHARACTER	LOW X
P	PRINT CHARACTER	LOW X
Q	PRINT CHARACTER	LOW X
R	PRINT CHARACTER	LOW X
S	PRINT CHARACTER	LOW X
T	PRINT CHARACTER	LOW X
U	PRINT CHARACTER	LOW X
V	PRINT CHARACTER	LOW X
W	PRINT CHARACTER	LOW X

(Continued on next page)

Table B-2: ASCII Character Code Function Summary (Cont.)

ASCII Char.	Alpha	Graph	Operational Mode Value		LCE Flag (note 1)
			Bypass	G/N	
X	PRINT CHARACTER	LOW X			
Y	PRINT CHARACTER	LOW X			
Z	PRINT CHARACTER	LOW X			
[	PRINT CHARACTER	LOW X			
\	PRINT CHARACTER	LOW X			
]	PRINT CHARACTER	LOW X			
`	PRINT CHARACTER	LOW X			
—	PRINT CHARACTER	LOW X			
`	PRINT CHARACTER	LOW Y			NORMAL, SOLID
a	PRINT CHARACTER	LOW Y			NORMAL, DOTTED
b	PRINT CHARACTER	LOW Y			NORMAL, DOT-DASHED
c	PRINT CHARACTER	LOW Y			NORMAL, SHORT-DASHED
d	PRINT CHARACTER	LOW Y			NORMAL, LONG-DASHED
e	PRINT CHARACTER	LOW Y			Reserved
f	PRINT CHARACTER	LOW Y			for future use
g	PRINT CHARACTER	LOW Y			
h	PRINT CHARACTER	LOW Y			THICK, SOLID
i	PRINT CHARACTER	LOW Y			THICK, DOTTED
j	PRINT CHARACTER	LOW Y			THICK, DOT-DASHED
k	PRINT CHARACTER	LOW Y			THICK, SHORT-DASHED
l	PRINT CHARACTER	LOW Y			THICK, LONG-DASHED

m	PRINT CHARACTER	LOW Y	Reserved for future use
n	PRINT CHARACTER	LOW Y	
o	PRINT CHARACTER	LOW Y	
p	PRINT CHARACTER	LOW Y	
q	PRINT CHARACTER	LOW Y	
r	PRINT CHARACTER	LOW Y	
s	PRINT CHARACTER	LOW Y	
t	PRINT CHARACTER	LOW Y	
u	PRINT CHARACTER	LOW Y	
v	PRINT CHARACTER	LOW Y	
w	PRINT CHARACTER	LOW Y	
x	PRINT CHARACTER	LOW Y	
y	PRINT CHARACTER	LOW Y	
z	PRINT CHARACTER	LOW Y	
{	PRINT CHARACTER	LOW Y	
	PRINT CHARACTER	LOW Y	
}	PRINT CHARACTER	LOW Y	
-	PRINT CHARACTER	LOW Y	
DEL		LOW Y or NO-OP (note 3)	SET LCE

NOTES:

1. The applicable ASCII character performs the function as listed when used as part of an escape sequence; LCE flag is an escape sequence introducer condition.
2. Filler CR's and filler LF's will not interfere.
3. In graph mode, the effect of DEL as a low Y character can be disabled by the DEL IMPLIES LOW Y option in graphics setup; if DEL cannot be used, the program can substitute ESC ?, which will perform the same function as DEL.

IGNORED 4010/4014 ESCAPE SEQUENCES

The following are the escape sequences for functions not implemented in 4010/4014 terminal emulation.

- ESC SO — select alternate character set
- ESC SI — select ASCII character set
- ESC p — set solid vector pattern with write-through
- ESC q — set dotted vector pattern with write-through
- ESC r — set dot-dashed vector pattern with write-through
- ESC s — set short-dashed vector pattern with write-through
- ESC t — set long-dashed vector pattern with write-through
- ESC u — set solid vector pattern with write-through
- ESC v — set solid vector pattern with write-through
- ESC w — set solid vector pattern with write-through
- ETB — make copy
- ESC FS — special point plot
- RS — set incremental plot
- ESC RS — set incremental plot

Request Terminal Status

Terminal status is requested by invoking the following escape sequence:

```
1/11 0/5  
ESC ENQ
```

This escape sequence will also cause bypass condition to be set. If alpha mode is in effect, the VAXstation I sends terminal status and the address of the lower left corner of the alpha cursor. If graph mode is in effect, the terminal sends terminal status and the address of the current active position.

Select Bypass Condition

Bypass condition is set using the following escape sequence:

```
1/11 1/8  
ESC CAN
```

Bypass condition inhibits the VAXstation I from responding to any data echoed back from the host.

Set Alpha Mode

Alpha mode can be selected using the following escape sequence:

```
1/11  0/12  
ESC   FF
```

In addition to selecting alpha mode, the screen is erased, the current position is moved to top left corner, margin 1 is activated, and bypass condition is cleared.

Set GIN Mode

GIN mode is selected by using the following escape sequence:

```
1/11  1/10  
ESC   SUB
```

Select Point Plot Mode

Point plot mode can be selected by using the following escape sequence:

```
1/11  1/12  
ESC   FS
```

In a 4014-series terminal, this escape sequence sets the terminal to special point plot mode, a mode identical to point plot mode except that the electron beam intensity is programmable. Special point plot mode is not implemented in the VAXstation I. As a fallback, ESC FS sets the terminal to point plot mode.

Select Character Size

Four different character sizes can be selected. These sizes are selected by the following escape sequences:

Sequence	Action
1/11 3/8 ESC 8	Selects 35 lines of 74 characters each.
1/11 3/9 ESC 9	Selects 38 lines of 81 characters each.
1/11 3/10 ESC :	Selects 58 lines of 121 characters each.
1/11 3/11 ESC ;	Selects 64 lines of 133 characters each.

Select Vector Patterns

The type of pattern used for vector drawing can be selected by the following escape sequences:

Sequence	Pattern	Intensity
1/11 6/0 ESC `	Solid	Normal
1/11 6/1 ESC a	Dotted	Normal
1/11 6/2 ESC b	Dot-Dashed	Normal
1/11 6/3 ESC c	Short-Dashed	Normal
1/11 6/4 ESC d	Long-Dashed	Normal
1/11 6/8 ESC h	Solid	Thick
1/11 6/9 ESC i	Dotted	Thick
1/11 6/10 ESC j	Dot-Dashed	Thick
1/11 6/11 ESC k	Short-Dashed	Thick
1/11 6/12 ESC l	Long-Dashed	Thick

Set LCE Flag

The LCE flag, an escape sequence introducer condition, is set by any of the following escape sequences:

1/11 7/15 ESC DEL
1/11 0/0 ESC NUL
1/11 0/13 ESC CR
1/11 0/10 ESC LF
1/11 1/11 ESC ESC

Delete Character

4010/4014 terminals have a "DEL implies LOW Y" strap option, which is supported in graphic set-up mode in the VAXstation I. This option allows the ASCII code associated with the DEL control character to be a possible low Y value in 4010 series coordinate specifications. Through this option, DEL can be enabled as low Y for graphics mode or disabled as low Y during graphics mode. Since this usage may conflict with some operating system's usage of DEL for synchronization, 4010/4014 terminal emulation accepts the following escape sequence as a functional substitute for the low Y coordinate value of DEL:

1/11 3/15
ESC ?

Miscellaneous Escape Sequences

The following escape sequences have the same function as when only the control character is invoked:

- ESC BEL — Same as BEL
- ESC BS — Same as BS
- ESC HT — Same as HT
- ESC VT — Same as VT
- ESC GS — Same as GS
- ESC RS — Same as RS
- ESC US — Same as US

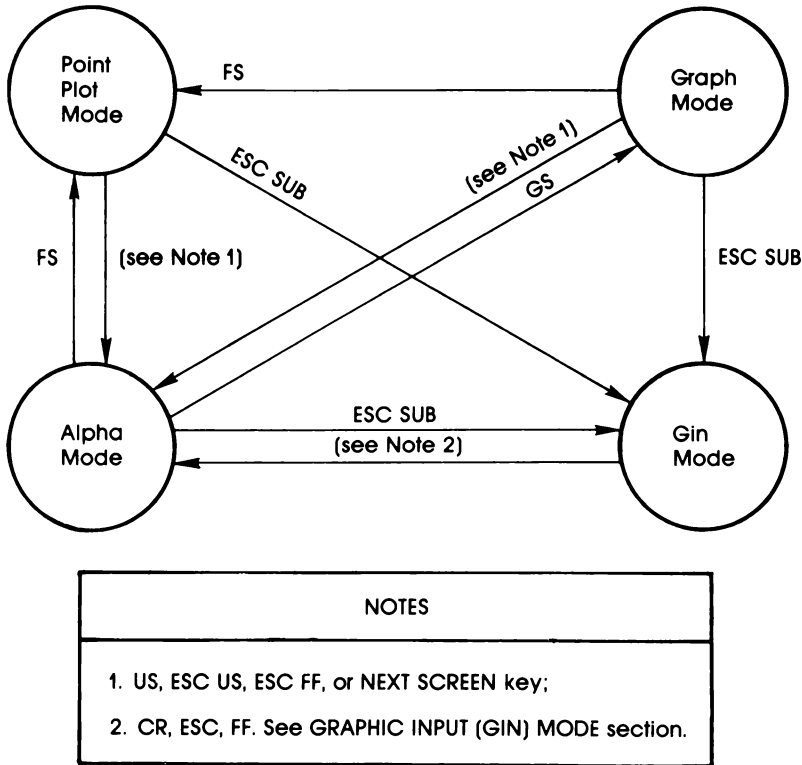
In addition, ESC FS will perform the same function as FS, due to a fallback condition in the VAXstation I's 4010/4014 terminal emulation.

CHANGING OPERATIONAL MODES

Once 4010/4014 terminal emulation has been entered, control characters are used to make transitions between the various operational modes. In some instances, escape sequences are used to change between modes.

Control characters or escape sequences used to change the operational mode of the VAXstation I can be generated by the host.

Figure B-1 shows the four operating modes available in 4010/4014 terminal emulation. Transitions between modes are represented by arrows. Shown with each arrow is the identification of the ASCII control characters (or escape sequences), which can be used to cause the mode transition.



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Figure B-1: 4010/4014 Terminal Emulation Transition Diagram

CLEARING THE SCREEN

4010/4014 series terminals have a "clear screen" key on the terminal's keyboard; the VAXstation I keyboard uses the middle mouse button or the keyboard key labeled E6.

BYPASS CONDITION

When bypass condition is in effect, the VAXstation I will ignore any characters received from the host until bypass is disabled. This allows the terminal to ignore its own transmissions if they are erroneously echoed by the host.

Bypass can be enabled by either keyboard input, or from the host, through any of the following escape sequences:

- ESC CAN — enables bypass condition while performing no other function
- ESC ENQ — enables bypass condition while requesting status information
- ESC SUB — enables bypass condition while placing VAXstation I in GIN mode

Bypass will be disabled upon receipt of any of the following:

- BEL — control character generating bell tone, if bell is enabled
- LF — control character causing new line operation
- CR — control character moving cursor to left margin and resetting VAXstation I to alpha mode
- US — control character resetting VAXstation I from graph mode to alpha mode
- ESC FF — escape sequence selecting alpha mode, and clearing screen
- mouse select button — selecting alpha mode and clearing screen

ALPHA MODE

In alpha mode, all characters received that are not ASCII control characters or escape sequence characters are displayed on the screen in the currently selected character size.

Control characters or escape sequences that are not valid Tektronix 4010/4014 commands, or that are for functions not implemented are ignored.

Alpha mode is the operational mode that is actively selected on entering 4010/4014 terminal emulation.

Margin Processing

Margin processing refers to the two-column character writing of the alpha mode. In two-column writing, there are two margins: margin 1, which is located at the left-most edge of the display area; margin 2, which is located at the center of each row in the display area. When rows of characters are being written from the left edge to the right edge, margin 1 is active. When rows of characters are being written from the center to the right edge, margin 2 is active.

Margin switching occurs automatically when the last row of characters has been filled for the currently active margin, or when a line feed is activated while at the last row of the display. When either of these actions occurs, further character processing is wrapped around to the top row at the new margin: Margin 2 if margin 1 was active, or margin 1 if margin 2 was active.

Since 4010/4014 series terminals are storage tube terminals, they cannot scroll. When printable characters are received in alpha mode, without intervening control characters, the characters are written in the following manner:

1. Initial character processing begins at the top left corner of the screen, across the complete top row to the top right corner.
2. When the right edge of a row is reached, character wrap occurs with the next character written at the left edge of the screen on the next row down.
3. Rows of characters continue until the bottom row is written.
4. Once the bottom row has been filled, the next character to be written is wrapped around to the top row at the middle of the screen.
5. Characters are now written from the middle of the screen to the right edge, overstriking any characters already printed.
6. As each row is filled, wraparound occurs to the middle of the next row.
7. Step 6 continues until the last row has been filled.
8. When the last row is filled, wraparound is to the top row at the left-most margin, and the process begins again.

Through this action, margin processing allows text writing to occur at either one column (full width), or two columns (half width). If one-column writing is desired, then the screen must be cleared before wraparound to margin 2 occurs. If two-column writing is desired, then CR and LF (or CR alone if selected in setup support for CR and LF) should be inserted in each row before writing reaches margin 2, so that wraparound will not overstrike any characters.

GRAPH MODE

In graph mode, vectors are drawn between specified absolute coordinate values. The absolute coordinate values are Tekpoint values mapped to the nearest corresponding VAXstation I physical pixel. The vectors are drawn in the currently selected line pattern.

The 4014 with Oct EGM has a 1024 X 1024 square matrix with the high 25% of the four addresses above the top of the display area. Coordinates can be specified within this area, and despite being off screen, they will be tracked accurately. As much of the requested vector will be drawn as appears within the actual display area. The remainder of the vector will be clipped.

Any valid 4010/4014 terminal escape sequences or control characters will be acted on in graph mode. Escape sequences and control characters that are not valid for 4010/4014 functions, or that are for functions not implemented in the VAXstation I, are ignored.

Line Patterns

Five basic line patterns can be used, with each pattern available as either normal or thick intensity. The following is a listing of the patterns that can be selected, along with identification of the escape sequences required for each selection:

- Solid (normal) — ESC `
- Solid (thick) — ESC h
- Dotted (normal) — ESC a
- Dotted (thick) — ESC i
- Dot-Dashed (normal) — ESC b
- Dot-Dashed (thick) — ESC j
- Short-Dashed (normal) — ESC c
- Short-Dashed (thick) — ESC k
- Long-Dashed (normal) — ESC d
- Long-Dashed (thick) — ESC l (lowercase L)

Drawing Command

The control character GS is used to enter graph mode from alpha mode. When in graph mode, GS defines the start of a vector draw.

In graph mode, vectors are not drawn from the active location when GS is invoked. The vector is drawn from the first coordinate value specified, to the next value specified. If more than two coordinates are specified following a GS control character, each new vector is drawn from the last coordinate drawn to, to the next coordinate specified. For example:

GS A B C D

Vectors will be drawn from point A to point B, from point B to point C, and from point C to point D. However, in the command:

GS A B GS C D

Two separate vectors are drawn, one from A to B, and another from C to D.

Encoding of Coordinates

4010/4014 terminal emulation supports 10-bit addressing. The Tekpoint matrix of the screen is defined as being 1024 X 820, with Tekpoints mapped to the nearest corresponding pixel.

Coordinates are encoded into 4 bytes Table B-3 shows the transmission order of these bytes, and identifies their formats.

4010/4014 terminal emulation supports shortened address transmission. That is, when only parts of an address change, only certain bytes need to be sent. The transmission rules for this shortened address capability are shown in Table B-4.

Table B-3: Coordinate Encoding Byte Values

Byte Name	Tag	Bits	7-Bit ASCII Character Address Bits				
			5	4	3	2	1
HI Y	0	1	5 MSB OF Y ADDRESS				
LO Y	1	1	5 INTERMEDIATE BITS OF Y ADDRESS				
HI X	0	1	5 MSB OF X ADDRESS				
LO X	1	0	5 INTERMEDIATE BITS OF X ADDRESS				

TABLE B-4: Shortened Address Capability Transmission Rules

Bytes Changed	Bytes Sent			
	HI Y	LO Y	HI X	LO X
HI Y	YES	NO	NO	YES
LO Y	NO	YES	NO	YES
HI X	NO	YES	YES	YES
LO X	NO	NO	NO	YES

POINT PLOT MODE

In point plot mode, no vectors are drawn. Instead, single pixels are turned on. The pixel turned on is the physical pixel most closely corresponding to the Tekpoint specified by absolute coordinate values.

Point plot mode values are transmitted identical to the coordinate values for graph mode.

As with graph mode coordinates, a coordinate may be specified that is not within the actual display area, but points so addressed would not be visible.

Point plot mode is entered from alpha or graph mode by using the FS control character. No other control characters or escape sequences are used for point plot mode functions. Most valid 4010/4014 escape sequences and control characters are acted on when received in the point plot mode. Escape sequences or control characters that are not valid for 4010/4014 functions or that are for functions not implemented in the VAXstation I are ignored.

ESC FS will also cause the VAXstation I to enter point plot mode from alpha or graph mode. However, this is a fallback function. In 4014-series terminals, ESC FS normally selects a special point plot mode, identical to point plot mode, except that the beam intensity is programmable. 4014/4014 terminal emulation does not implement special point plot mode.

Once in point plot mode, all coordinate values are transmitted without specifying FS (or ESC FS) again.

GRAPHIC INPUT (GIN) MODE

GIN mode is entered by invoking ESC SUB. The terminal enters a local mode in which the following occurs:

- The VAXstation I crosshair cursor appears, with the hairs intersecting at the current active position.
- Bypass condition is enabled.

Once in GIN mode, the active position can be changed by using the mouse to reposition the crosshair cursor over the position desired.

If ESC ENQ is received from the computer while the crosshair cursor is being displayed, the address of the intersect point will automatically be sent to the computer. This will be followed by CR or CR and EOT, if selected by Setup option. If the select button (the leftmost mouse button) is pressed, GIN mode is terminated with a space as the terminator character.

GIN mode can be terminated while the crosshair cursor is being displayed, without transmitting to the computer. Program command CR or ESC FF will terminate GIN mode, switching the terminal to alpha mode. However, CR may leave the terminal in either margin 1 or margin 2 status, and ESC FF will erase the display. It may be better to terminate by sending ESC ENQ and ignore the transmission at the computer.

GIN mode can be exited from the keyboard: once the active position has been properly selected (or if already correct on entering GIN mode), pressing any active key on the keyboard will result in the following:

- The ASCII code of the key pressed is sent to the host.
- The coordinates of the crosshair cursor at the time the key was pressed are sent to the host in 10-bit addressing format.
- The graphics cursor disappears from the screen.
- The VAXstation I leaves GIN mode, enters alpha mode.

At this point, however, the VAXstation I is still in bypass mode. Further keyboard input is necessary to get the VAXstation I out of bypass. See the separate description of bypass condition for identification of all control characters and escape sequences that can be invoked which will terminate bypass.

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